American Aviation

NOVEMBER 21, 1955

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ORDNANCE EXTRAORDINARY! The Terrier, the Navy's new all-weather anti-aircraft missile, is now being produced in quantity by Convair in the Naval Industrial Reserve Ordnance Plant of the U.S. Navy's Bureau of Ordnance. Responsible for supplying our Navy with the most effective weapons, the Bureau of Ordnance participates in vast programs of research, development, testing, and procurement. The Bureau of Ordnance facility at Pomona, California, managed and operated by Convair, is an outstanding example of government and industry working together to produce weapons systems for the defense of our country.

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SPECIAL NEWSLETTER ON THE NEW WILCOX "CANARI"

First announcement of new space-saving, weight-reducing, airborne electronics system developed by Wilcox. Of special interest to aviation industry management and engineering personnel.

WHAT'S THE CANARI? It's the new Wilcox Communications and Navigation Airborne Radio Instrumentation (CANARI) System. The CANARI is a "package" system, made up of basic navigational and communications devices used on modern aircraft...in one system.

Each element is completely compatible with all other elements. Weight and size are reduced. How much? Read on! Modern, miniature components and new circuit design techniques, packaging and fabrication are used. And...at no sacrifice to performance, reliability and ease of maintenance.

THE SITUATION NOW IS THIS: Present assemblies are individual units. Each is self-sufficient. Each has its own shockmount, dynamotor power supply, audio amplifying circuits. Each is different size, shape. Each adds to total weight of airframe.

WILCOX BELIEVED THIS WAS WASTEFUL! Wilcox knew that size, weight and compatibility problems were severe enough on propeller-driven aircraft...shuddered to think of magnified problems on turbo-props and turbo-jets. SO WILCOX DID SOMETHING ABOUT IT! The result—The CANARI System.

UP TO FIVE HUNDRED POUNDS OF EQUIPMENT ELIMINATED! Let's compare the CANARI with typical installation using separate units. The CANARI cuts space needs more than half. The CANARI weighs one-third as much. About 200 pounds can be saved on minimum, basic CANARI system. BUT...a big but...a typical airline aircraft—where nearly all equipment is installed in duplicate—could

save up to five hundred pounds with the CANARI! Five hundred pounds for added passengers or fuel...that's in addition to enough space saved to install a full, dual CANARI in the area normally used for unduplicated, conventional system.

THE CANARI is assembled on one, custom-fitted shockmount. One junction box serves whole system. Junction box may be factory wired. You can get one package ready to mount with just three simple connections to make. All assemblies are same height. Width varies, but in definite fractions of ATR width. Depth uniform.

PERFORATED EQUIPMENT COVERS are used throughout. This steps up convection air circulation. Also, new heat-dissipating tube shield is used in conjunction with ARINC, airline-approved, miniature tubes. Sealed type components are used throughout.

SO, NOW IT'S HERE! The CANARI saves space, saves weight, saves time, saves money, makes money in any aircraft in which it is installed!

WILCOX ELECTRIC COMPANY
Fourteenth and Chestnut • Kansas City 27, Missouri, U.S.A.

RUSH ME detailed information on the Wilcox CANARI!

Name _____

Position _____

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YOU CAN'T AFFORD TO TURN THIS PAGE WITHOUT TEARING OUT AND MAILING THE COUPON NOW! Or write, wire or phone to the address below . . . right away!

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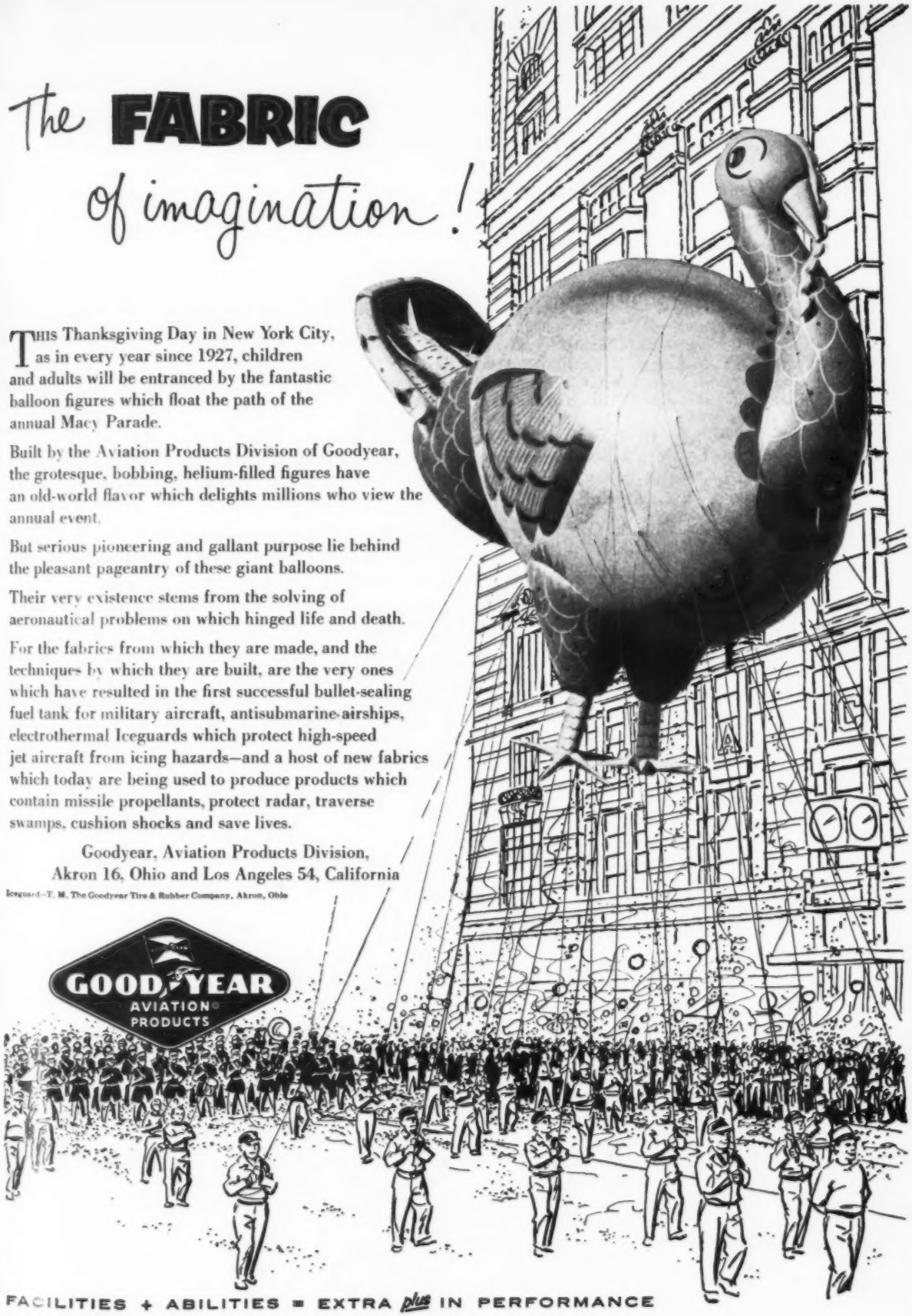

THIS Thanksgiving Day in New York City, as in every year since 1927, children and adults will be entranced by the fantastic balloon figures which float the path of the annual Macy Parade.

Built by the Aviation Products Division of Goodyear, the grotesque, bobbing, helium-filled figures have an old-world flavor which delights millions who view the annual event.

But serious pioneering and gallant purpose lie behind the pleasant pageantry of these giant balloons.

Their very existence stems from the solving of aeronautical problems on which hinged life and death.

For the fabrics from which they are made, and the techniques by which they are built, are the very ones which have resulted in the first successful bullet-sealing fuel tank for military aircraft, antisubmarine airships, electrothermal Iceguards which protect high-speed jet aircraft from icing hazards—and a host of new fabrics which today are being used to produce products which contain missile propellants, protect radar, traverse swamps, cushion shocks and save lives.

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Akron 16, Ohio and Los Angeles 54, California

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ABC BPA NBP ABP

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NOV. 21, 1955 - VOL. 19, NO. 13

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HERE ARE FACTS WHY

DME IS A SAFE INVESTMENT

There has been so much smoke and confusion about future navigation systems that the airspace is apt to be filled with ideas instead of navigation signals.

The situation has understandably bewildered aircraft owners and given them cause to wait and see—even though they realize that a navigation system which gives them both distance (rho) and bearing (theta) would greatly simplify their cross-country navigation and IFR operations.

These facts are now clear and cannot be disputed:

1. The VOR/DME system is fully developed providing highly dependable and extensive service. Congress has appropriated funds for continuation of this system. There are 231 DME's in operation now and 175 more on site ready to be turned on when additional funds become available.

2. CAA, in its 5 year navigation program proposal just made public, calls for 383 more VOR's and 648 additional DME's.

3. The Air Coordinating Committee, whose recommendations generally set National Air Policy, has assured DME operation for years to come. ANDB's decision earlier this year was not to *adopt* Tacan, merely to investigate its possible use in the Common System.

4. Tacan is still in a very experimental stage as a common system element. In its present form it is strictly a tactical navigation equipment. Conservative estimates say that four years would be required to re-engineer ground equipment for satisfactory civil airway use. No satisfactory design for airline or small aircraft Tacan has been demonstrated. Tacan does not provide voice communication or ILS approaches and these functions would require separate equipment if Tacan were adopted in its present form.

5. Implementation of such a system on the airways to the same level of operation as VOR/DME today would require eight to ten years. This has been confirmed by CAA, ANDB and IATA.

6. There is no argument in any quarter as to the reliability, accuracy, or dependability of present-day DME. It is recognized by all as being equally accurate as any other distance measuring system. It has been completely "de-bugged" and backed by a nation-wide service.

7. New, authorized DME approach procedures are already being published in the Airman's Guide and are being incorporated in the Jeppesen Manual as fast as released. These DME approaches permit lower minimums in many cases where terrain clearance has been a problem, reduce to a minimum let-down procedures, greatly expedite instrument operations. Australia has made DME mandatory for airline operations and pilots report DME far more accurate than older systems of using cross-bearings and even fan markers for position indication.

8. The conclusion which can be drawn by any clear-thinking aircraft user is that:

- **No other system can possibly supersede DME for a decade.**
- **VOR/DME provides *today* and in the years to come a highly superior navigation system with continuous position indication without estimate, calculation or guess-work.**
- **Highly reliable, light-weight airborne DME is available today.**
- **Anyone installing DME in his aircraft can be assured beyond any question of doubt of getting a full span of usefulness out of his DME with no danger of rapid obsolescence.**

If you would like more information on the Narco Model UDI-IA DME see your nearest Narco distributor, factory-approved service center or write to National Aeronautical Corp., Ambler, Pa.

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Industry News Digest

Johnson Committee Still Digging Into Navy F3H-J40 Procurement

The case of the Navy's procurement of the F3H Demon fighter is still very much alive.

Although one Congressional group (Rep. Chet Holifield's Military Operations subcommittee) has completed its investigation and indicated it is ready to chalk the whole affair up to experience (AMERICAN AVIATION, Nov. 7), another committee (Sen. Lyndon Johnson's Preparedness Investigating subcommittee) is still out hunting for culprits.

In a preliminary report issued earlier this month, Johnson emphasized (a) he wasn't yet ready to place responsibility for the F3H-J40 program's failure; (b) the probe was continuing; and (c) it might reveal other plane programs (in addition to the XF4D, XA3D, and XF10F) adversely affected by Westinghouse difficulties with the J40 jet engine.

While the Johnson subcommittee drew no conclusions, it did summarize its findings (prior to the Holifield hearings, it carefully explained), as follows:

• "(1) That in excess of $300 million has already been spent;

• "(2) That the first 60 planes will never perform their intended mission;

• "(3) That 107 J40-22 engines received by the Government are unsuitable for their intended mission;

• "(4) That at least 12 serious accidents and 18 aborted flights due to malfunctions have occurred in testing the F3H, with four lives lost;

• "(5) That the Westinghouse engine-development program had a costly impact upon the procurement of at least three other airplane models; and

• "(6) That the F3H-2, powered with the Allison J71 engine, has yet to fully prove itself qualified for its combat mission."

Sen. Johnson elaborated somewhat on the new F3H-2 model. One of the new planes, he said, recently passed its preliminary tests satisfactorily. But, he added, the Navy has reported certain "discrepancies" which it estimates "will take from six to eight weeks to remedy."

If this estimate is accurate, therefore, the end of the year should find the Navy with its long-sought all-purpose fighter, ready for mass production.

• **Meanwhile,** a spokesman for the Holifield subcommittee revealed that its report will be delayed until after the first of the year. He said, too, that the report will stick closely to the F3H-J40 experience as shown in the subcommittee hearings. No effort will be made to expand its study to other aircraft programs.

Besides making a chronological review of the F3H program, the Johnson Subcommittee estimated costs of the airframe and engine procurements. It estimated current McDonnell contracts (one for 150 and one for 130 planes) were valued at $510,784,000, including engines and Government-furnished equipment. On its first contract, the subcommittee said, McDonnell had received progress payments totaling $133,183,379 (as of March 31, 1955) and a progress payment of $8,300,376 on the second contract.

The subcommittee noted that the F3H-1's tentative target price was estimated at $775,000 per plane, while the F3H-2 "firm target price" has been established at $1,024,200.

• **The J40 engine** development and production program cost the Government $220 million, the subcommittee reported.

Referring to the Grumman F10F fighter, originally programmed around the J40, the subcommittee related its fate as follows:

"The contract for this airplane has been terminated in its entirety and no other engine was ever ordered to be installed. Parts for 10 or 12 planes had been built and two experimental models produced when cancellation occurred. The major parts and assemblies that had been built were ordered destroyed. The cost of this program was $22,285,000."

North American-Columbus Starts F-100 Deliveries

First deliveries of F-100 Super Sabres from North American Aviation, Inc. Columbus division recently marked initial second-source output of the supersonic Air Force fighter. Second Columbus-built F-100 (above) takes off for Warner Robins Air Materiel Area, Ga. Prime production source is North American's Los Angeles plant.

AA Picks Aeroproducts Propeller For Electra

General Motors became a two-time winner in the commercial turboprop transport field recently with the selection by American Airlines of Aeroproducts propellers for its Lockheed Electra transports.

Earlier AA launched GM's entry into the commercial turboprop engine business when it chose Allison 501-D10 engines to power its Electras.

Propeller selected by American is a 13.5-foot diameter, four-bladed model using hollow steel blade construction. Although specially designed for the commercial installation, it retains the same basic features of earlier Aeroproducts turboprop designs with several additions.

Included are a fully reversing fea-

ture with both variable hydraulic and mechanical low-pitch stops, as well as mechanical pitch lock and selective pitch control for ground operation. The new propeller also provides for auto-feathering and for ice control for blades, cuffs and spinners.

CAB Gives Nonskeds Indefinite Extension In Split Verdict

CAB last week authorized the nation's large irregular air carrier industry to continue operations for an indefinite period, only under specific flight limitations. At the same time, the Board granted commercial clearing-house licenses to the Independent Military Air Transport Association and Aircoach Transport Association.

The Board was split 3-2 on the irregular carrier issue with Members Chan Gurney and Harmar D. Denny opposed to the indefinite extension advanced by the Board majority.

Non-scheduled airlines not now entangled in enforcement proceedings were authorized to operate 10 flights per month between any pair of points carrying individually-ticketed passengers. Also, generally unlimited charter rights were conveyed.

The carriage of individually-ticketed passengers was the main point of the Gurney-Denny dissent, reportedly one of the bitterest dissents in recent years. The decision involves the so-called "policy phase" of the Large Irregular Air Carrier Investigation.

CAB recently reopened hearings on qualifications of individual non-sked applicants for the authority conveyed by the "policy" decision. Those found fit will be awarded the 10-flight authorization; those unfit presumably will be terminated.

The IMATA-ACTA Exchange Case involves proposals of those two organizations to serve as central agencies in the commercial charter field in much the same manner they serve their members in arranging military charter flights.

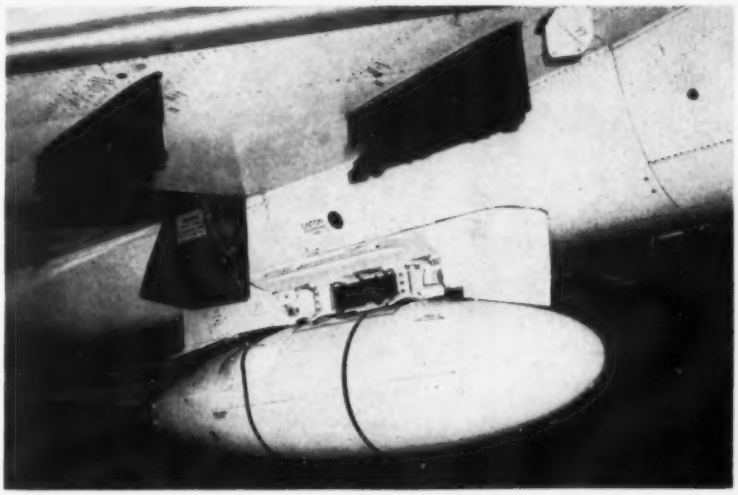
TWA Orders More 1049Gs

Trans World Airlines has ordered eight additional Lockheed 1049G Super Constellations, bringing its Super G fleet to 28 and total Constellation fleet to 109.

The new aircraft are slated for delivery starting in June 1956, with all eight preceding the 24 long-range 1649 Constellations due TWA beginning in the spring of 1957.

TWA will use the new Super Gs in mixed-class (coach and first class) service on domestic and international routes.

Navy's Demon Gets a Self-Starter



Closeup view shows one of the first Navy installations of an AiResearch produced pod-mounted gas turbine starter mechanism on a McDonnell F3H-2N Demon. Entire starter mechanism measures about five feet in length, two feet in diameter and weighs approximately 450 pounds. Unit can be used in "stowed" position shown, or fitted with wheels for ground operation. Shell is manufactured by Douglas Aircraft Co.

Five Trunklines Win New Routes In CAB Denver Service Decision

CAB issued its decision in the Denver Service Case last week (Nov. 14) granting new route awards to five domestic trunklines as follows:

• **American Airlines** Routes 7 and 25 amended to authorize nonstop service between Chicago and San Francisco/Oakland.

• **Continental Air Lines** Route 29 amended by creation of new route between Chicago and Los Angeles. Action involved eastward extension of CAL's Denver-Kansas City route to Chicago and westward extension from Denver to Los Angeles. Restrictions: (a) Kansas City-Chicago service only on flights originating or termination at Los Angeles; (b) no single-plane service permitted through Denver and points south thereof; (c) no single-plane service permitted between Chicago and points south of Kansas City.

• **Trans World Airlines** Route 2 amended to include Denver as an intermediate point. Restrictions: (a) No service permitted to Denver on flights serving Kansas City or St. Louis; (b) flights serving Denver to and from Los Angeles, San Francisco, or Oakland, must originate or terminate at Chicago or points east.

• **United Air Lines** Route 1 amended to include Kansas City as intermediate between Omaha and Des Moines; also, Pittsburgh, Pa. added as new UAL intermediate in supplemental opinion in New York-Chicago Case released simultaneously with Denver decision.

UAL's Kansas City service is subject to restriction against service on flights serving Denver or Chicago. Pittsburgh service is subject to a long-haul restriction requiring all flights serving Pittsburgh to originate or terminate west of Chicago and stop at Chicago.

Also, CAB ordered an investigation to determine if certificates of American, TWA, and United should be amended to eliminate a restriction against off-route operational stops.

All other applications in the case were turned down as was an Examiner's recommendation for a Continental-Capital interchange over Chicago.

All CAB Members agreed on most phases of the decision. Only dissent was a joint disagreement by Members Chan Gurney and Harmar D. Denny with respect to the Chicago extension for Continental and the permission to TWA for Denver-San Francisco service.

The "need for vigorous competitive transcontinental service" was cited in connection with United's new awards. AA was put in the Chicago-San Francisco market because "the size and importance of the market justifies an effective service by a third nonstop carrier."

Newly-amended certificates will become effective in the customary 60 days on January 13, 1956.

1

2

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4

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PRATT & WHITNEY AIRCRAFT
DEPENDABLE ENGINES

ONE OF THE DIVISIONS OF
UNITED AIRCRAFT CORPORATION

THE FASTEST FLY WITH THE J-57

In the Air Force, J-57 turbojet engines power the fastest fighters—including the holder of the official world speed record. In the Navy, J-57s power the fastest carrier-based aircraft, fighters capable of supersonic speeds in level flight. The mighty B-52, new strength of the Strategic Air Command and the fastest bomber, is powered by J-57 engines, as is the fastest transport now flying, the 707 prototype jet tanker-transport.

In all of these powerful aircraft, and in many others, Pratt & Whitney Aircraft's J-57 advanced turbojet engine has been chosen to meet the exacting requirements of high thrust rating, reliability and efficiency.

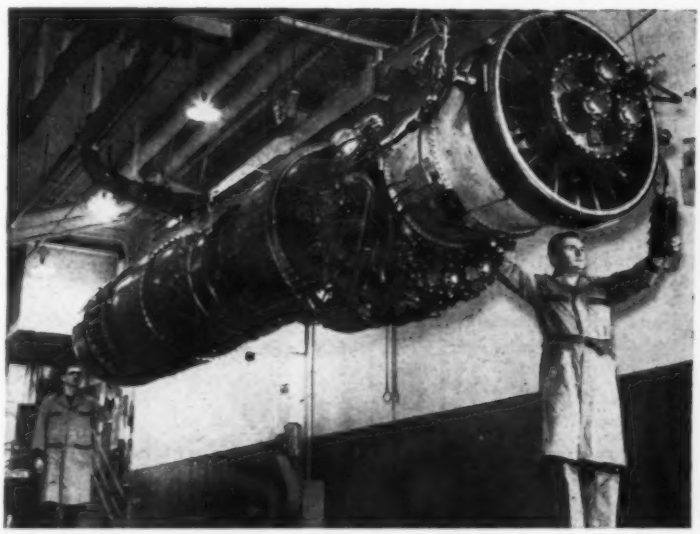
The leading land-based and carrier-based fighters, the new mainstay of the heavy bomber fleet, and the jet transports are all designed to take advantage of the performance of the J-57 engine. Pratt & Whitney Aircraft's J-57 is continuing to make its vital contribution to American air strength.

1. SUPERSONIC RECORD HOLDER—The North American F-100C holds the official world speed record, 822.135 miles per hour. Already in operational use in the USAF Tactical Air Command, the F-100C Super Sabre can deliver an atom bomb at high speed.

2. MIGHTIEST OF THE BOMBERS—The Boeing B-52 Stratofortress uses eight J-57 engines hung in pods under the wings. Now in units of the Strategic Air Command, the B-52 can be refueled in flight to extend its range as needed. Speed is over 600 m.p.h., ceiling over 50,000 feet.

3. JET TANKER-TRANSPORT—Boeing's 707 prototype, with four J-57s, is the fastest transport and the first of a new family of advanced jet aircraft. The Air Force has ordered production of a tanker-transport version, the KC-135. As a commercial transport, the aircraft could carry from 80 to 130 passengers, cruising in the 550 m.p.h. range.

4-5. FASTEST NAVY FIGHTERS—The Douglas F4D Skyray, left, with delta wing, set a 753.4 m.p.h. record on a three kilometer straightaway run. The new Chance Vought XF8U-1 Crusader, right, with swept wing, features a trim, lightweight airframe and uncluttered design. Both are equipped with afterburners, and can exceed the speed of sound in level flight.



THE POWERFUL J-57—Pratt & Whitney Aircraft's efficient J-57 provides more than 10,000 pounds of thrust. Afterburners increase the basic thrust greatly for short periods of operation. The engine delivers rapid acceleration and is economical of fuel, adding to the high performance of the world's fastest, most powerful combat aircraft.

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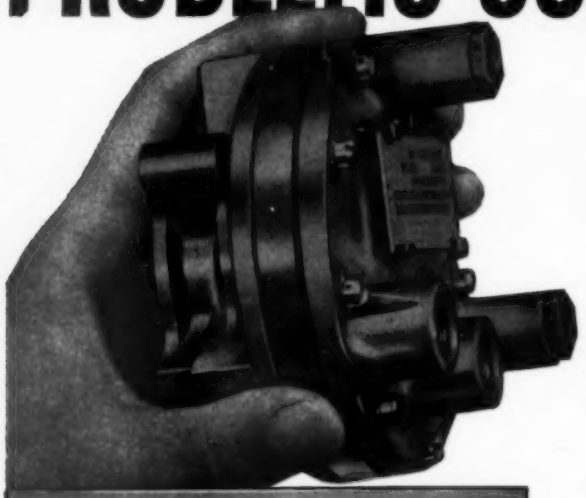
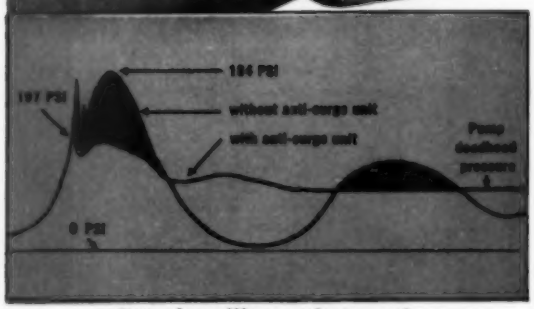


with New Anti-Surge Fuel Level Control Valve



Actual oscillograph records

The shaded area represents the portion of the higher pressures eliminated by the use of the anti-surge feature under identical conditions at 227 gpm.

With the increasing use of pressure fueling for greater speed and efficiency the dangers from excessive surge pressures have become correspondingly acute. A dependable method of control has been a necessity for some time.

Recently a major airplane manufacturer asked Parker to help solve this critical problem. Immediately a Parker Team of engineers and production specialists from the Fuel Division went to work. Results of their work are conclusive. **Now! Excessive surge pressure can be eliminated**... eliminated by the use of this **New Parker Anti-Surge Valve** (pictured here).

The anti-surge device limits the line pressure at the inlet of the shutoff valve under *any anticipated operational surge conditions* and in particular, those encountered in hydrant fueling systems. *This "PARKER" method essentially controls surge pressures by regulating the level control valve's rate of closure.*

It is sure, safe, proven and available for your use. For information write to the FUEL DIVISION, Los Angeles.

Let a Parker Team help you

A Parker Team is available to you on any problem involving aircraft fuel valves, hydraulic valves and check valves. If you have a problem in these fields or are beginning system design, get a Parker Team on your staff.

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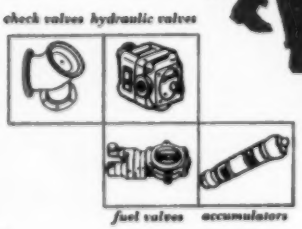


Parker

Hydraulic and fluid system components

Circle No. 3 on Reader Service Card.

Personal View

By WAYNE W. PARRISH

How to Lynch a Good Idea In One Easy Lesson

IT IS DISCOURAGING to watch a simple, clear and constructive idea being distorted, twisted and sabotaged.

For many years industry has complained that staff members of the Civil Aeronautics Board are woefully ignorant of even the most elementary knowledge of what makes an airline tick. Some CAB employees have never even flown on a commercial carrier. Yet they endeavor to regulate and call the shots for a complex industry about which they know very little first-hand.

Last summer CAB Chairman Ross Rizley toured the showcase bases of United Air Lines at Denver and San Francisco. Quite new to aviation himself, he was much impressed by what went on behind the scenes of a large carrier. He expressed the view that some means should be found to acquaint CAB staff members with such operations.

United and other airlines responded enthusiastically at once. Too long and too often the airlines have had to explain simple fundamentals of airline functions to both staff and Board members in the Washington CAB offices. Better understanding of industry at the source would make for better regulation.

Then came the distorted press reports, augmented now by a recent amazingly ill-informed editorial in our contemporary, *Aviation Week*, giving the impression that the Rizley proposal involves virtually unlimited "free airline rides" to CAB employees. Reports have even been going the rounds that wives of employees are also to be entitled to free trips.

There is always a reason for distortion. Newspapers, wire services and magazines don't intentionally twist the news. The source of the distortion in this case emanates from right within the CAB's own organization where one individual, who happened not to like the proposal, has planted poison instead of giving the press the full and accurate story.

What the Rizley proposal involves is very simple indeed. It suggests a series of educational field trips for CAB staff members. The carrier or carriers involved must file a special tariff for the specific number of persons involved for the specific days and specific itineraries. Such a tariff request must have formal Board action in the public fishbowl. No free hotels. No junketing. No repeats. The staff members would be working and paid per diem when on the trips.

Yet out of this formal, legal, constructive and highly controlled proposal, come press reports of "free airline rides" as though all that a Board or staff member had to do was to walk into an airline ticket office at any time and present a pass to fly anywhere free.

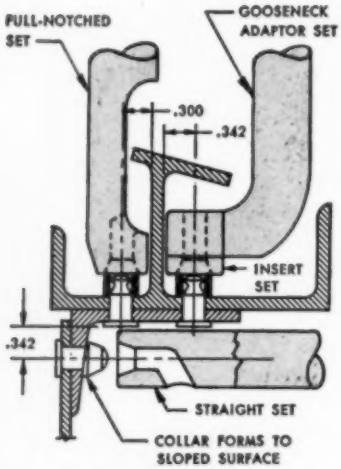
Our contemporary, *Aviation Week*, makes quite a point that other government agencies purchase their transportation, so why not CAB? But in the first place only the CAB is the regulatory agency for common carrier air transportation, so if there are any exceptions it should certainly be this agency.

But do the others always pay? *Aviation Week* mentioned specifically the CAA and the military services. Does the CAA pay, indeed? It just happens that the CAA has obtained CAB approval for as many as 4,000 separate unpaid airline trips *in a single year* (1954) on scheduled carriers, all, presumably, in connection with CAA (and aviation) business. It is true the military services are important buyers of air transportation, but the Hoover Commission report on the amount of traveling in their own planes rather dilutes the argument that the military are pure lily-white.

What started as a sincere move to educate a relatively few CAB staff members by a limited number of specific working trips has thusly become embroiled—thanks to one particular CAB staff member whose sabotaging of the Board is an open secret—into a silly fiasco about "free airline rides." Quite childish.

HERE'S A TOUGH PROBLEM OF ACCESSIBILITY

for some fasteners but easily licked with HI-SHEARS!



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Letters

Hey, There, Mr. Stevens!

To the Editor:

You deserve to be commended for your excellent October 24 issue. However, I am taking my pen in hand once again to supplement Mr. Stevens' fine article . . .

Not once has Mr. Stevens mentioned the aerophysics principles that permit *augmentation of thrust* by deflection of a *horizontal lift component.*

Aerophysics principles have been ineffectively expounded to our aviation industry by Willard R. Custer for several decades and they have been discourteously overlooked for at least eight years that I, myself, have been pushing them. Yet interested Russian scientists are lapping up any and all of these principles . . . Custer, with his channel wing, first succeeded in putting these almost mythical forces to practical use and opened a door leading to a tremendous new future in the aviation industry. . . .

Aerophysics principles are basically simple: For air to move, there must be a change in pressure. Therefore, and conversely, there IS a change in pressure whenever air moves. The greater the velocity of the air in movement, the greater the difference in pressure. When of sufficient magnitude this pressure differential can be directionally controlled to exert a working force. Correctly applied, this force can permit either uni-directional or omni-directional flight in accordance with control procedure used.

The recently publicized "Marilyn Monroe" fuselage is an acceptable, though inefficient, approach to application of the aerophysics principles that can be put to use with little further development on the part of accomplished technicians. This fuselage, like many other more complicated structures listed as "boundary layer control" or "jet flap" devices, serves the primary purpose of accelerating smooth airflow on one side of a structure having a slower-moving air mass on a different side.

The impact pressure differentials of the dynamic airflows exerts some resultant force on the structure. In the case of this fuselage the resultant forces of lift and thrust occur at an angle of attack which would normally provide greater drag for a like speed and no resultant force.

In jet aircraft that do not have adequate "blo-in" or "sucker" doors, impact pressure differentials have not only collapsed the air intake ducting, they have collapsed the aircraft structure as well. It should not be too inconceivable for a person versed in pressure forces to realize that a structurally-adequate channel wing can lift "impossible" weights. Even an aerodynamicist will concede that a 700 mph airflow exerts a pressure differential exceeding 1200 lb/sq. ft. When this force is applied below a channel wing, "Something's GOTTA give!" Forces exerted below a channel depend on the air velocity that is provided through it.

Propeller design, alone, regulates the velocity of the air sucked through the channel since powerplants have already been developed with adequate horsepower to develop high-velocity airflows. Turbo-fan and by-pass engines also supply adequate airflows for stupendous lifting capability.

When power is applied so that the developed thrust supplies direct lift rather than "push" the overall effect is a flatter power-requirements curve. The parasitic and induced drag of a "push" application of power requires it to be "cubed" in order to double any speed. Essentially, this is caused by increasing the size of the airplane with a thick layer of compressed air. Thus power must not only lift the airplane, it must also push the airplane and create a steady volume of compressed air which must be pushed with the plane.

On the other hand, when it is applied to induce direct "lift" in a channel wing, the thrust produced by a direct power application converts the airflow to a combination of forces. The thrust is increased due to the conversion of centrifugal over-pressure from the propeller into additional velocity, and the thrust velocity provides a lift force which is quadrupled as the velocity is doubled. Although the thrust velocity is raised, the propulsive efficiency is lowered slightly with increased velocity, and it might seem that the end result is undesirable from a "speed" consideration.

However, the resultant of the thrust and lift forces is a force of greater magnitude than the thrust force, alone; and by correct deflection the resultant force can be applied by aircraft angle of attack either to reach exceptional forward velocities or to provide hovering capabilities.

These principles have been well proved universally, and yet their applications are in infancy here in America. Recent military security classifications being considered, if applied, will only delay common conception needed to restore initiative to the aeronautical field. . . .

I urge that the aerophysics information needed to provide economical omni-directional flight be promoted by those who are qualified to recognize the logistical impact of this science.

DEL SANTEE
Aerophysics Consultant
Valdosta, Georgia.

For the Record . . .

To the Editor:

In your October 10, 1955 issue, under "Production Spotlight," you had an item concerning inconsistencies between American and British aircraft parts terminology re: Capital Airlines' only non-weather Viscount cancellation.

This inconsistency occurred on our shift. It was not the failure of the mechanics to identify the spare labeled "electrical unit" etc. I believe the mechanics at "Chi" know a starter if they see one. The inconsistency was in the stockroom set-up and not our inability to identify a starter. In fact it was a mechanic who identified the starter—or I should say discovered it. Just for the record.

CHARLES KLUKO
Capital Airlines
Maintenance
Chicago

Production Spotlight

• Navy should be declassifying some details and photographs on the Talos surface-to-air missile soon. McDonnell builds the powerplant for the Bendix missile and RCA is responsible for the guidance equipment.

• Anticipated Navy-USAF feud over the Martin jet flying boat may not materialize. James H. Smith, Jr., assistant Navy Secretary for Air, says the Navy will have no objection to the Air Force buying P6M SeaMasters if the service can use them.

• Fairchild Aircraft Division's new pilotless aircraft project for USAF has been designated the "Goose." Convair's competitive missile reportedly is unnamed. Goose will be built at Hagerstown, Md. Fairchild's Petrel missile is in production at the company's Long Island guided missile division.

• Air Force has decided to hold up release of information on the Republic supersonic F-105 fighter-bomber for some time, despite the fact the plane already is at Edwards AFB, Calif., for flight tests. Not too much is being said about three new USAF planes ready for first flight—Bell X-2, Ryan jet-powered VTO and the F-105.

• An Allison J35 turbojet has been shipped to Northrop Aircraft at Palmdale, Calif., for installation in an F-89D interceptor.

• USAF decision to transfer development and production of the Douglas C-132 cargo transport from Santa Monica to Tulsa is the first indication the 100,000-lb. payload plane actually will be built. Plane, which will gross about 500,000-lb., will be powered by four 15,000 ehp Pratt & Whitney T57 turboprops.

• Capital Airlines has experienced 14 mechanical delays with Vickers Viscount transports in the first three months of operation. Average length of delay has been 16 minutes.

• Delay in Eastern Airlines confirmation of the Allison T56 as its Electra powerplant is not all that points to possible use of some other engine. Among airframe changes in the revised Electra is an increase in some wing nacelle plate thicknesses from .062" to .250".

• Pan American World Airways, only U.S. carrier to overhaul its own Douglas superchargers, estimates it saves $250 per overhaul plus airfreight charges to and from Santa Monica. PAA set up a $40,000 shop in Miami to handle the job.

• Although the project is considered classified, Bell Aircraft has been testing a new air navigation system. Bell's project parallels AT&T's Tacan system.

• Decision to stretch out production of the Fairchild C-123B assault transport will meet with Army protests. The ground service has been calling for early delivery of the Avitruc for several years.

• Entry of Grumman, Northrop and Allison into the atomic airplane field means that virtually every airframe and engine producer is now involved in propulsion of aircraft by atomic power. Others include: GE, Pratt & Whitney, Westinghouse, Curtiss-Wright, Lockheed, Boeing, Convair, Martin and others.

• TAC commander General O. P. Weyland intimates his aircraft can now carry hydrogen as well as atomic weapons.

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When & Where

Nov. 21-22—Symposium on aeronautical communications sponsored by Institute on Radio Engineers, Hotel Utica, Utica, N. Y.

Nov. 25—Third Convertible Aircraft conference, Philadelphia.

Nov. 28-30—Instrumentation conference and exhibit, sponsored by I.R.E., Atlanta Biltmore Hotel, Atlanta, Georgia.

Nov. 30-Dec. 2—Air Transport Association airline finance and accounting conference, New Orleans.

Dec. 1—American Astronautical Society, Second annual meeting, American Museum of Natural History, New York, N. Y.

Dec. 2-3—Eighth annual aviation conference & flight clinic, Tucson, Ariz.

Dec. 5-6-7—Air Transport Association Agency Committee meeting, Woodner Hotel, Washington, D. C.

Dec. 6-7—Professional Race Pilots' Association annual convention & business meeting, Carter Hotel, Cleveland.

Dec. 6-7-8—Air Transport Association, Passenger Tariff Committee, Adolphus Hotel, Dallas, Texas.

Dec. 12-16—Nuclear Engineering & Science Congress, sponsored by Engineers Joint Council, Public Auditorium, Cleveland.

Dec. 15-17—International Radio Scientific Union, U.S. National Committee fall meeting, Gainesville, Fla.

Dec. 17—Wright Brothers Lecture, U.S. Chamber of Commerce Building, Washington, D. C. (Wright Day Dinner, Sheraton Park Hotel.)

Jan. 9-10—National Symposium on Reliability and Quality Control in Electronics sponsored by Institute of Radio Engineers, Statler Hotel, Washington, D. C.

Jan. 9-13—Society of Automotive Engineers annual meeting, The Sheraton-Cadillac and Hotel Statler, Detroit.

Jan. 19-21—National Simulation Conference sponsored by Dallas-Fort Worth Chapter of Institute of Radio Engineers Group on Electronic Computers, Dallas, Texas.

Jan. 23-26—Plant Maintenance and Engineering Conference and Show, Convention Hall, Philadelphia, Pa.

Feb. 2-3—National Symposium on Microwave Techniques, sponsored by Institute of Radio Engineers' Antennas and Propagation Group, and Theory and Techniques Group, Philadelphia, Pa.

Mar. 19-21—Society of Automotive Engineers, National Production meeting and forum, Hotel Statler, Cleveland.

April 9-12—Society of Automotive Engineers, National aeronautic meeting, aeronautic production forum and aircraft engineering display, Hotel Statler, New York.

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Books

British Civil Aviation. *By D. G. T. Harvey. Published by John de Graff, Inc., 64 W. 23 St., New York. 168 pp. Price, $3.*

Primarily of interest to British readers, this book contains information on all aircraft flying with United Kingdom airlines. It also provides information on each United Kingdom operator. Other sections of the book are devoted to aircraft in the project stage, flying boats and helicopters. The book also contains a section on airline personnel, enumerating conditions of employment and salaries for certain categories.

Gas Turbines and Jet Propulsion. *By G. Geoffrey Smith, revised and enlarged by F. C. Sheffield. Sixth Edition. Published by Iliffe & Sons Ltd., London, and Philosophical Library, New York. 412 pp. Price, $15.*

This is the sixth and most comprehensive edition of a book based on a series of articles which appeared in the British magazine *Flight* in 1941 and which is accepted as one of the most authoritative works on the subject.

The book was first published as a small volume in 1942 and has grown apace, in keeping with the rapid development of gas turbines and jet propulsion in aviation. Since the death of the author, G. Geoffrey Smith, in 1951, the work of revision has been assumed by F. C. Sheffield, an associate of the author for many years. He has brought the whole text up to date and enlarged it.

There are 342 photographs and illustrations in the text and four fold-out drawings. A foreword has been written by Sir Harold Roxbee Cox, formerly president of the Royal Aeronautical Society and director of the National Gas Turbine Establishment.

. . . B.B.

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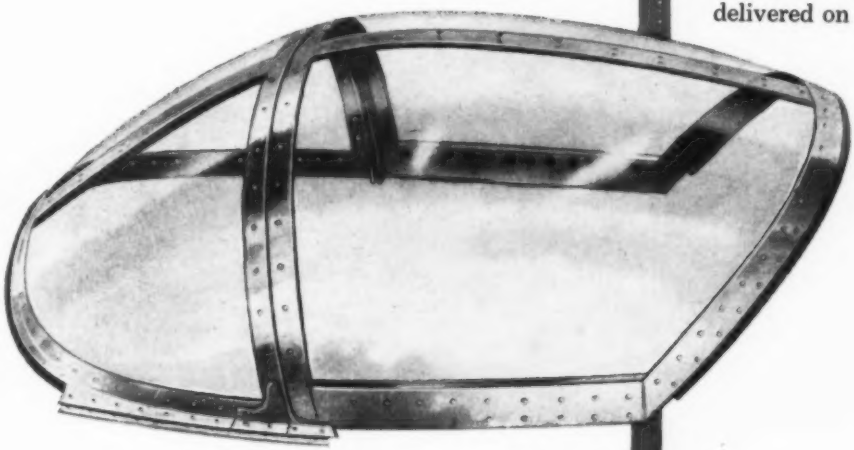

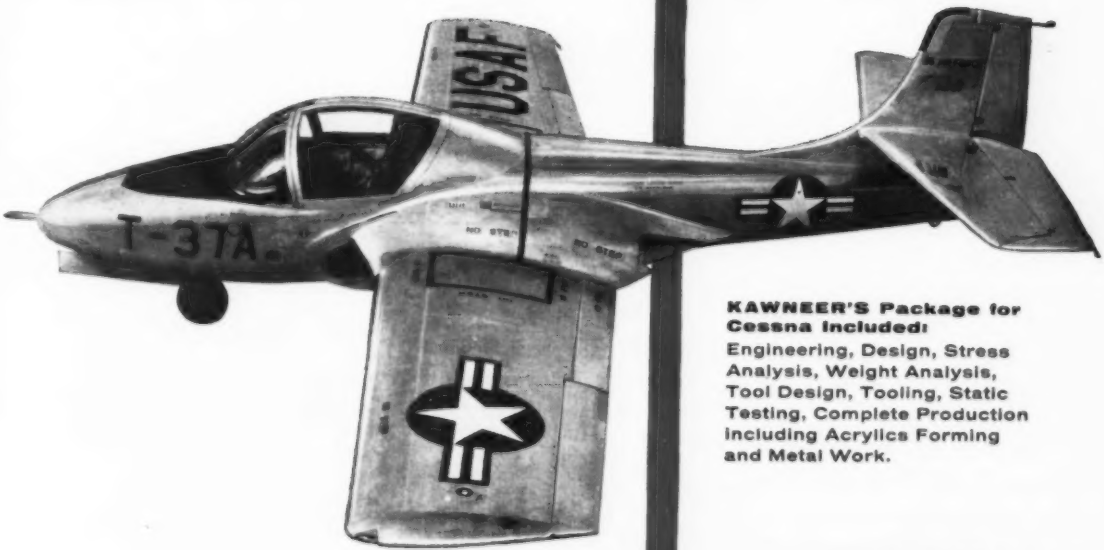

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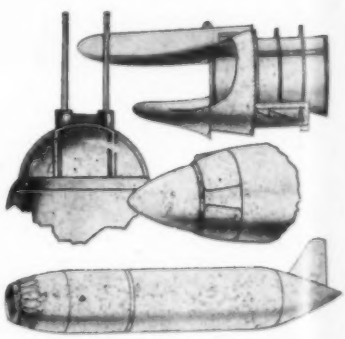

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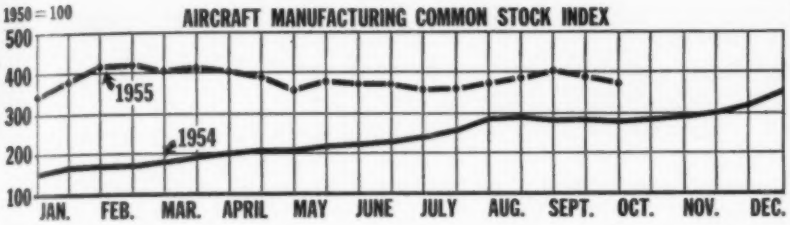
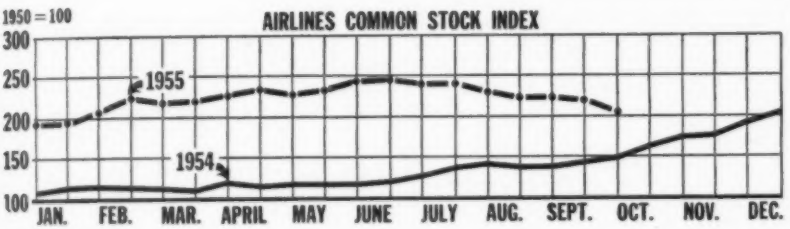
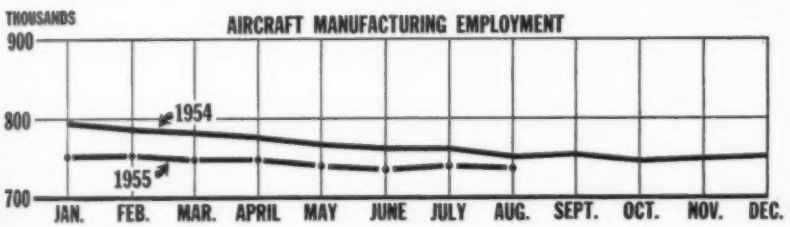
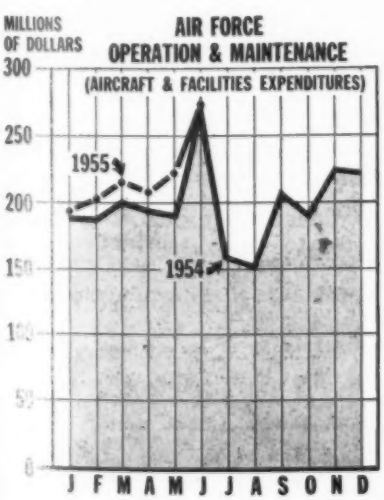
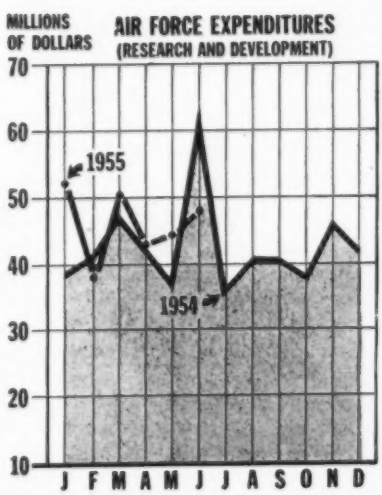
Pulse Of The Industry











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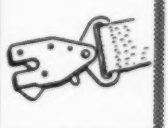

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STATES AND CITIES WHICH ARE ATTEMPTING to tax the materials in aircraft and other defense plants before they are converted into finished planes and products for the government have a new problem to contend with—a U.S. Supreme Court action in a similar case.

By refusing to consider an appeal from a decision of the U.S. Circuit Court of Appeals, the highest tribunal, in effect, upheld the lower court's finding that the tax was being imposed on federal property and is therefore unconstitutional. Case specifically involved the Murray Corp. of America, an Air Force subcontractor, and the City of Detroit and Wayne County, which imposed the levies.

Feeling is that the Murray Corp. contract involved no "unusual" clauses and may therefore serve as a pattern for future cases involving taxation attempts by states and cities on "work in process." In the only other similar case reaching the Supreme Court, the firm involved (in Arkansas) under the contract was acting as an agent of the U.S. Navy.

Meanwhile, two aviation firms—Convair and Aerojet-General—have filed suit in Los Angeles Superior Court for themselves and 75 other defense contractors to try to recover property taxes of about $15 million previously paid to Los Angeles, San Diego and Alameda in 1953 and 1954.

RESPONSIBILITY FOR DEVELOPMENT of the medium-range guided missile has been assigned to the U.S. Air Force, the Defense agency already handling the 5,000-mile range intercontinental weapon.

Action was recommended by the Joint Chiefs of Staff over protests by Army's Gen. Maxwell D. Taylor and reportedly already has approval of Defense Secretary Wilson.

Joint Chiefs have been trying to decide whether to go ahead with the mid-range missile (actually 750-to 2,500-mile range, but labeled one capable of hitting a target 1,000 miles distant) for several months. Apparently Russia's missile progress—and perhaps a feeling that the Convair intercontinental Atlas may need an assist—are responsible for the JCS action.

Army's protests are understandable. As far as Taylor is concerned, the mid-range missile is just another form of long-range artillery. Moreover, the Chrysler Redstone may one day be developed into a "bird" with a 1,000-mile range.

But the new ruling will not affect the Redstone, or even a later version of the Navy's Chance Vought Regulus. These will remain within the province of the service now developing them. Only newer medium-range missiles will be administered by the USAF.

AIRCRAFT MANUFACTURING EMPLOYMENT is again on the upswing toward the January 1954 postwar peak of about 800,000. Following a gradual but steady decline to 738,000 in June 1955, tide was turned in July, and early 1956 forecasts place employment again in the 780,000 to 800,000 bracket.

Major portion of the increases will be reflected by larger airframe, engine and accessory producers. Most small firms are unable to predict labor needs as little as six months in advance because of fluctuating subcontracting demands placed upon them by large manufacturers.

And despite Pentagon's dispersal policy, such key west coast areas as Los Angeles, San Diego and Seattle are expected to record largest personnel gains.

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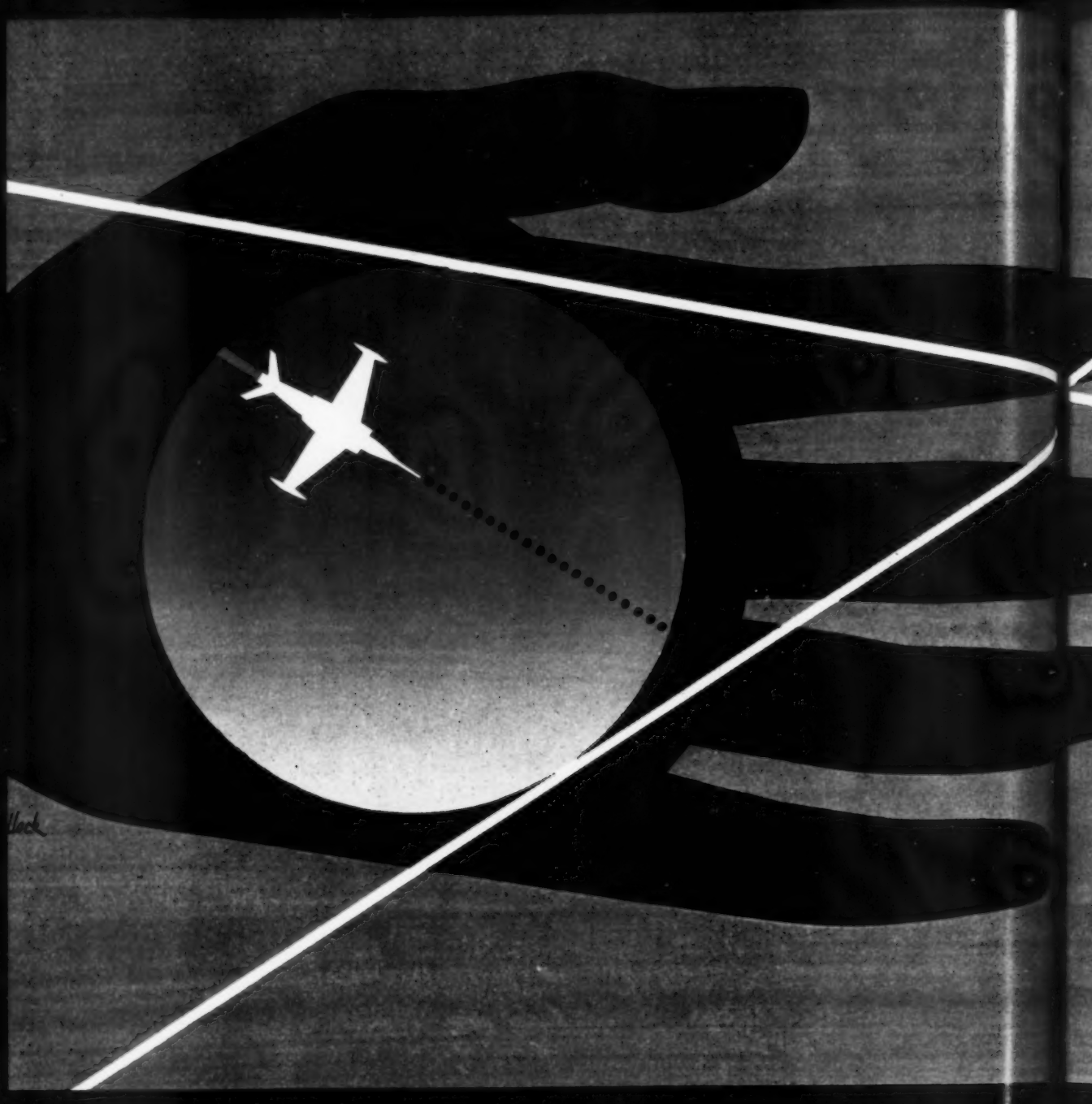

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American Makes Bid for Lead in Jet Race With $165-Million Order for 30 707s

- **Plans first daily transcontinental service beginning in June, 1959.**
- **Insurance company provides $75 million in financing assistance.**

By WILLIAM V. HENZEY

AMERICAN AIRLINES this month became the fourth U.S. airline purchaser of jet aircraft and also came up with a claim to an unbeatable "first." It plans the first transcontinental jet service with daily schedules starting June 15, 1959.

The airline, which now owns 186 planes, increased its total on order to 95 with the purchase of 30 Boeing 707 jet transports, first of which will be delivered in March, 1959.

• **AA's announced** starting date is five months ahead of the November, 1959 inaugural planned by United Air Lines. UAL recently ordered 30 Douglas DC-8 jets with first delivery expected in May, 1959.

American said its planes will cost about $4.5 million apiece for a total order of approximately $135 million. This figure is considered exclusive of spare parts which add about $1 million to the price of each plane, making a total of about $165 million for the 30 aircraft.

United's order with Douglas for the same number of planes, including spare parts, will total about $175 million.

Boeing-Douglas Gap Closes

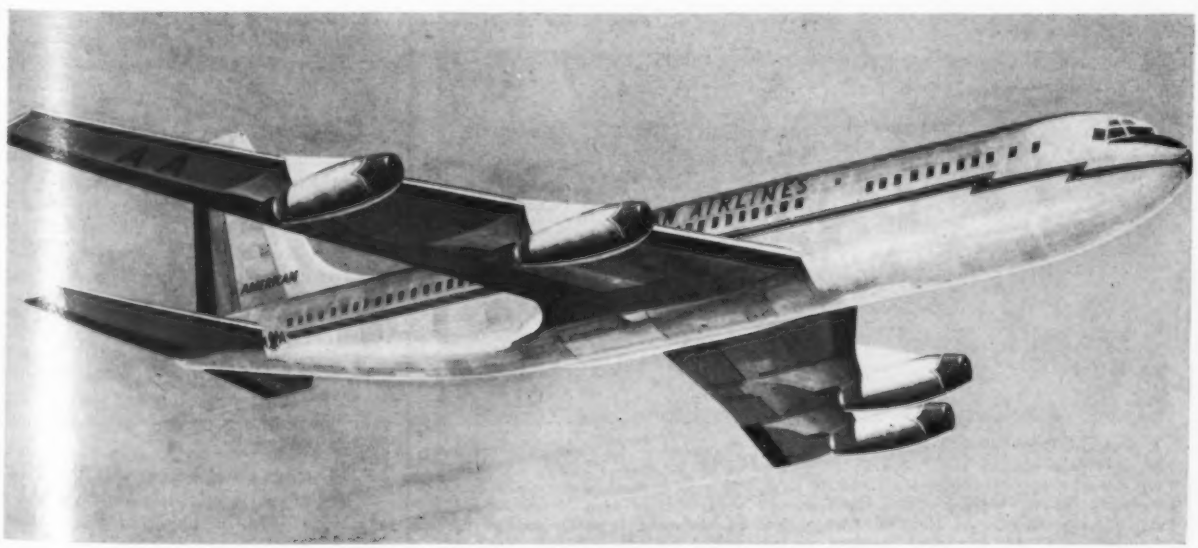
The American order closes the gap between Boeing and its U.S. competitor, Douglas, in the commercial jet race. On the basis of firm orders placed thus far, Douglas has a backlog of 61 DC-8s; Boeing, with firm orders for 50 of its 707s, is not too far behind.

Broken down, the orders look this way: Douglas-Pan American, 25; United, 30; and National, 6; Boeing-Pan American, 20; and American, 30.

Next major order is expected from Eastern Air Lines which has "budgeted" $125 million for 20 jets but which has not yet decided between the DC-8 or 707. Trans World Airlines' plans are still a mystery although there is speculation that TWA may buy Boeing.

From the dollar standpoint, the jet orders of the four airlines involve a total outlay of approximately $645 million. Add Eastern's budgeted amount of $125 million and the three-quarter billion dollar mark is passed with room to spare.

• **American's 707s** will be powered by Pratt & Whitney J57 engines. Of orders placed thus far, all involve the J57, except Pan American's DC-8 order



Boeing 707 in American Airlines markings. This is the jet transport that will span the continent in four hours, 15 minutes.

which contemplates the more powerful J57 engine.

Though involving comparatively less power, the lower-numbered engine means earlier delivery, a point of extreme significance at this time, particularly among domestic airline competitors. American's president C. R. Smith explained: "We don't need the extra power of the J75s."

American also secured agreement from Boeing to equip each jet with a silencer fixed permanently to the exhaust of each engine and a reverse-thrust breaking device.

AA's Operation Plans

• **American plans** its initial operation on its main transcontinental route between New York, Chicago and Los Angeles. (A pending CAB decision in the Denver Service Case could result in San Francisco/Oakland being included in these early plans.)

Both the one-stop service via Chicago and transcontinental nonstops are planned for the initial operation. As more planes are delivered, the super speed service will be extended to other cities on AA's routes.

Already, the competitive flight time controversy which marked transcontinental schedules of the past few years is evident for the 1959 jet picture. United listed a tentative eastbound nonstop schedule from Los Angeles to New York of 4½ hours. American now expects its 707s to do the same hop in 4 hours, 15 minutes.

Since the first such service is still almost four years away, however, adjustments in estimated scheduled times can be anticipated.

• **American, like Eastern,** will have a "transition" sparked by the inauguration of turboprop service in August, 1958. It has new piston-engined planes on order for earlier delivery and the turboprops will "bridge the gap" between the piston-engine deliveries and the advent of jet service in 1959.

Here is what AA's overall equipment picture now looks like: Its present fleet of 186 planes consists of 74 Convairs, 50 DC-6s, 25 DC-6Bs, 25 DC-7s, three DC-6As and nine DC-4 freighters.

On order are four DC-6As for 1956 delivery, 14 DC-7s for 1956-'57 delivery, and 12 DC-6Bs for 1957 delivery. In 1958, the first of 35 Lockheed Electra turboprops will be delivered and put in service, and the following year the Boeing 707s will arrive.

AA's Electra order, including engines and spares, approximates a total outlay of $77.5 million.

Financing Detailed

• **Just a few days** before announcement of the 707 jet order, American revealed details of its financing for those planes. It completed arrangements for private placement with the Metropolitan Life Insurance Co. of a $75-million issue of 4% notes.

The notes are due in 1996, and the agreement provides that the funds will be made available to AA, in varying amounts, during 1956, 1957, 1958 and 1959. Sinking fund payments are to begin in 1967, in equal installments.

The new aircraft orders and financing arrangements come at a time of peak revenues for AA. During the first nine months of 1955, revenues jumped to $194,895,000, or $40 million more than the comparable 1954 period. Net earnings after taxes were $14,337,000.

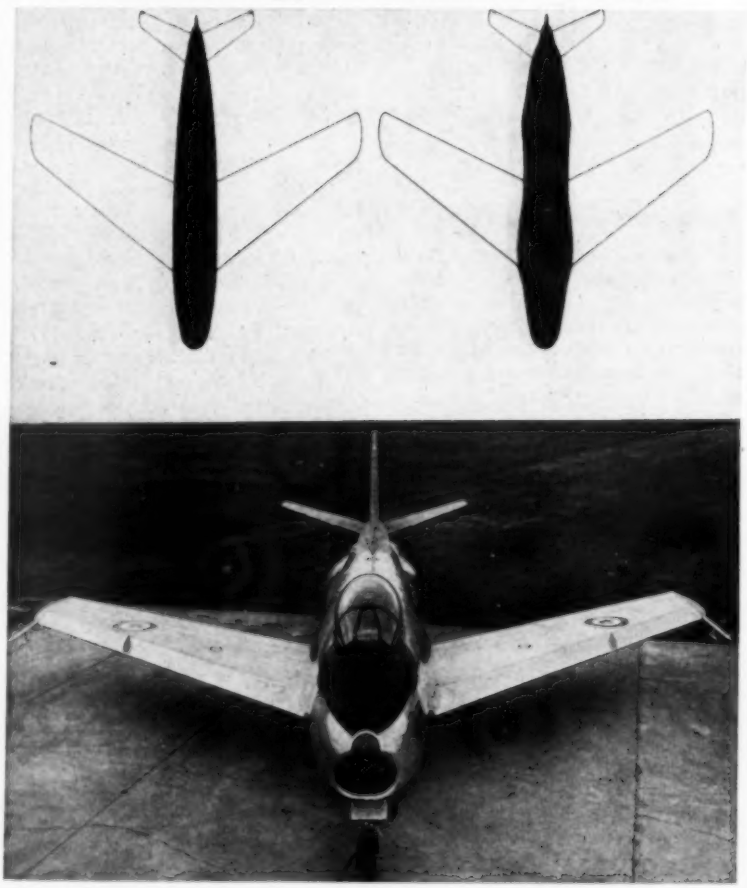
• **For the present,** AA's jet order and other equipment plans must be weighed in relation to those of United and TWA, its chief competitors in the transcontinental field. Thus, while not the first jet purchaser, AA, on the basis of announced delivery dates, must be considered in a forerunning position in its market, although the final outcome will hinge on relative performances of the two U.S.-made jets.

Pan American, meanwhile, is alone in its field with its dual-jet order and actually will be the first airline with jets in service. For its overseas routes, the carrier expects delivery of the first of its 707s late in 1958. Delivery of PAA's DC-8s, with the J75 engines, will start about a year later.

• **Vying to be first** in domestic jet service but in a different market than AA's and UAL's, is National Airlines whose claims of being the actual first purchaser of jets were finally borne out by Douglas this month.

During CAB hearings in the New York-Florida Case this summer, NAL's president G. T. Baker disclosed that NAL had "firm delivery dates" for DC-8 aircraft, six of which had been

Canadair Applies Area Rule to F-86



A standard Canadian-built F-86 Sabre has been converted to a "wasp waist" version to determine whether the "Area Rule" discovered by National Advisory Committee for Aeronautics (AMERICAN AVIATION Sept. 26) will increase performance in the transonic range. Plane, produced by Canadair under license from North American Aviation, for RCAF and National Aeronautical Establishment, is at Uplands Airport, Ottawa, Canada, for tests. Drawings of contrasting fuselages are shown above.

ordered at a total cost of about $36 million.

Douglas was noncommittal at the time and participated in a joint announcement heralding PAA's order as the first by a U.S. airline.

But when United's DC-8 order came along subsequently, Douglas revealed that National's claims were, in effect, accurate. The manufacturer first needed an order from a larger carrier possessing a full engineering staff with which the manufacturer could work in arriving at complete airline specifications.

• **PAA's order,** being for the J75 engine, was no help in this situation. But United's for the J57 engine was all that was needed. Ten days ago, Baker reported from Miami that Douglas had notified him they have set the first DC-8 delivery for May, 1959 and that "National will receive its first DC-8 at that time."

Baker says the 130-passenger DC-8s should be in service as early as the summer of 1959 operating two-hour, 21-minute schedules between Miami and New York. NAL is slated to get one of the first Douglas production models of the DC-8 in time for that summer operation, two additional planes before November, 1959 and the remaining three in mid-1960. ◈ ◈ ◈

Industry Gets More Important Role In Air Force's New R & D Program

By ROBERT M. LOEBELSON

Air Force's new policy for greater participation by the aircraft industry in both the short- and long-range research and development programs boils down to something like this:

Air Research and Development Command at Baltimore has broken down the entire R&D program into 46 broad functional areas, covering such fields as strategic bombing, communication, navigation, active bomber defense, etc. A staff study, designated a Technical Program Planning Document, has been prepared for each area. Each of the documents includes:

• **A statement and definition** of the military job the USAF will have to do 10 or 15 years from now in the particular area.

• **An evaluation** of the present technical capability in the area and a pointing up of the limitation of present materiel and techniques. In other words, it outlines how far the USAF is from the task it wants done.

• **Pertinent research summaries,** proposed innovations, and suggestions on avenues of approach to stimulate thought.

• **Presentations** of technical requirements which explicitly define desired performance objectives. About three "technical requirements" are found in each document. In essence they describe what must be done technically to make the transition from present technical capabilities to the AF's future job.

Until now, these Technical Program Planning Documents have been sent only to ARDC centers, principally to determine the projects and resources which would be needed to satisfy the technical requirements.

At that point ARDC centers would ask the aircraft industry for proposals to fulfill these objectives and a waiting process would start. Sometimes industry companies would volunteer proposals based on their independent effort. These frequently were technically sound but out of phase as far as time and requirements were concerned.

According to Brig. Gen. Thomas L. Bryan, Jr., commander of Wright Air Development Center, "The waste of time, talent and funds involved in this kind of arrangement are luxuries we simply cannot afford." To speed up the process, he adds, and to make certain all efforts would be applied in the same and proper direction, "it became not only obvious but mandatory that we make the direction known to our contributors."

• **As the first step,** ARDC in October sent out its first letters to 104 USAF contractors picked by the Air Materiel Command-ARDC Source Selection Board as having adequate security clearances as well as interest and capability for R&D activity in specific document areas.

Bryan reports ARDC has since received "enthusiastic expressions of interest" from the industry in replies to the first letters and has taken action to make the first distributions of Technical Program Planning Documents to qualified and interested contractors. Later on the Armed Services Technical Information Agency at Dayton is expected to handle distribution.

• Next, the AMC-ARDC Source Selection Board is screening the names of other AF contractors and a second list is expected to be completed sometime in December.

• **The third phase,** still in the future, is one in which ARDC expects to realize some of the greatest gains. This will take place when ARDC announces that it is prepared to receive queries and requests from potential R&D sources which are not now USAF contractors. Questions about this and other parts of the program should be addressed to the Commander, ARDC, P.O. Box 1395, Baltimore 3, Md., Attn: RDTDD, Development Plans and Programs, Director of Development.

Tied in with the plan are a series of Technical Program Symposiums which ARDC will be sponsoring on an annual basis. First such meeting with industry took place in New York Sept. 13-15 under the auspices of ARDC's guidance and control division. Seven of the 46 R&D areas were covered at the time.

Another symposium guided by the

Britain's Latest Hunters in Service

RAF Squadron No. 41, stationed at Biggin Hill, Kent, one of the principal bases in the Battle of Britain, has been equipped with Mark 5 versions of the Hawker Hunter. The transonic interceptors are powered by Armstrong Siddeley Sapphires.

aeronautics and propulsion division will be held in Cleveland at the end of January. By next July, the seven divisions in ARDC's directorates of development expect to have held seven meetings in various cities covering all 46 areas.

In addition to the long-range technical program, ARDC's research activities are also focused on the short-range (7-8 years away) operational program. This represents the work done on weapons ready for use now or soon. It includes the development management of complete weapon systems and the development engineering of all the equipment going into these systems. Also covered are such operational support items as crash trucks and parachutes which are not tied to any one system. Each of these items in the operational program has a fixed date of entry in the AF inventory and generally uses techniques already in wide use.

Bryan said the policy of making AF long-range technical program requirements known to the industry right from the start is designed so that aviation firms "will take a more active part in exploratory development and support more of it from within your own resources."

He told his audience: "We are convinced that by giving you the whole technical picture, you will voluntarily start to take on more independently supported exploratory development and to fire in proposals as soon as you have something you feel will give us the big jumps we need.

"Then, too, if any of the techniques or capabilities embodied in your proposals can be put 'on the shelf' as it were, ready at all times to be used to satisfy operational requirements, we can avoid the mad scramble we had in the past to invent as we built. This will gain time for us, and time is our most important commodity." ◆◆◆

Chicago's O'Hare Field Opens; Planned To Meet Needs of Next 20 Years

What is believed to be the world's largest airport, O'Hare Field, Chicago International Airport, was opened to scheduled passenger service October 30. It covers an area of 6,325 acres—1,000 more than New York's giant Idlewild field—and some 700 acres still remain to be acquired.

Long needed to relieve increasingly costly congestion at Chicago's Midway Airport, O'Hare Field has been 10 years in the building. It was begun on a 1,080 acre tract deeded to the city by the federal government following World War II.

Terminal facilities are capable of handling 2.4 million passengers annually, or approximately 30 per cent of Midway's traffic. O'Hare's development is based on a master plan, comprising three stages, designed to enable the airport to keep pace with the most optimistic projections of air traffic growth for the next 20 years.

• **The first stage** of the master plan has been completed and gives only a hint of the future. Within three years, O'Hare is expected to be able to handle 15 million passengers annually, and within five years 15 million more.

The two-level terminal building, which has a passenger concourse on the second level, eventually will be expanded to ten times its present size. Presently it is merely the nucleus of a "five-fingered" passenger terminal provided in the master plan.

Expansion of terminal and other facilities, including loading positions, fuels systems and the like, will be consistent with the limiting factor of runway capacity. While there are four runways, only one is instrumented, limiting the capacity of the field to 15 plane movements an hour under Instrument Flight Rules conditions and to 40 plane movements an hour in Visual Flight Rules weather.

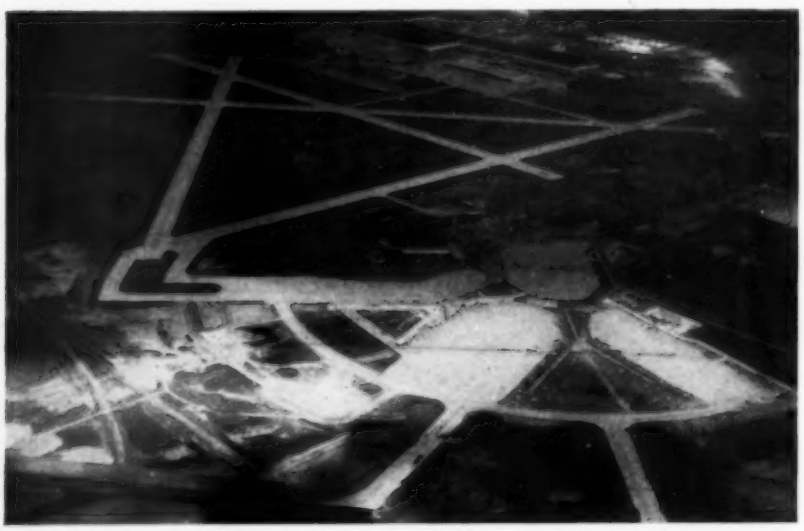
A second instrument runway, 8,000 feet long and paralleling the first, is slated to go into operation before the end of the year. It will double the capacity of the field. Scheduled for construction during 1956 is a new E-W runway 8,100 feet in length, which will add 50 per cent to the capacity of the field under IFR conditions and increase flexibility of control of flights in and out of the field.

• **A unique feature** of O'Hare will be the tangential arrangement of its runways. The master plan provides for six, radiating like spokes from the central terminal area, so that none will intersect and aircraft will be able to take off and land on all six simultaneously and in as many directions of the compass.

The arrangement also permits maximum separation of aircraft. At point of touchdown, the runways will be over a mile apart, and at taxi point, over 1,500 feet apart. Pavement has been designed to take any aircraft operating or on the boards.

Compared with Midway's 34 gate positions, O'Hare has only 16 to start. The addition of a second "finger" and the expansion of the central terminal building will provide upwards of 29 loading stations within the next three years and 37 by 1960, when passenger traffic at O'Hare is expected to exceed Midway's.

• **Midway traffic** will be frozen at about 5.5 million passenger movements annually, after the proposed transfer of 30 per cent of current passenger schedules is completed. Initially, only 10 per cent of inbound and outbound flights are being moved to O'Hare. To date, only four of the scheduled passenger airlines have begun operating at O'Hare. They are United, American, TWA and Northwest. Previously Slick Airways



AERIAL VIEW of Chicago's O'Hare Field, believed to be largest in world. Taking 30 per cent of Midway's traffic, O'Hare went into operation last month when United, American, TWA and Northwest Airlines made their first flights from the field.

Spiral baggage shute at O'Hare Field

had been the sole scheduled carrier based at O'Hare.

Capital, Braniff, Delta-C&S, Eastern and North Central will come in some time after the first of the New Year. Any new schedules added by the airlines will go to O'Hare after 30 per cent of Midway flights are transferred.

No suspension of passenger service at Midway is contemplated, but should a time come when developments should dictate such a move, O'Hare will be able to take over. When all six tangential runways are in, it will have a capacity of 360 plane movements an hour. All six conceivably may never be necessary—with vertical take-off planes in the offing—but plans are ready, and the land is there.

Likewise, so long as Midway continues to handle passenger traffic, a "three-fingered" terminal building with 66 gate positions is expected to suffice for O'Hare, but this, too, can be readily expanded further to provide up to 94 loading stations and passenger terminal facilities to handle all of the estimated 22 million scheduled airline passengers who will be enplaning and deplaning at Chicago annually by the end of 1975.

• The **master plan** for O'Hare is flexible. It was drawn up by the city with the active participation of all carriers serving Chicago through the joint airline technical engineering committee.

"In the main, airline suggestions were followed, which is something not frequently done," said Ray Ireland, vice president of United and chairman of the airline committee on O'Hare.

The plan is geared to provide for all possible contingencies. It includes a hotel, motel, motion picture theatre, amusement park for children, restaurants, shops and provisions for a host of other concessions, all to be located within the central terminal area. "Idle" land within the extreme boundaries of the airport will be leased for industrial development to desirable light industries. They will be selected in such a way as to minimize the danger of air pollution.

• **O'Hare was built** to be self-sustaining. Greater portion of its revenues is expected to come from non-aviation activities, thus reducing the financial load of the airlines. Under an agreement with the city, the airlines are obligated to make up any deficits to the city. Approximately $19,575,000 has been expended so far in developing O'Hare. Another $30,000,000 will be needed over the next three years. In all, to carry the master plan to a conclusion, the budget calls for $75,000,000 or $100,000,000.

O'Hare will be the first to try an experiment which may well revolutionize airport design as well as passenger loading. Plans call for the direct loading of passengers from the second-floor concourse level onto planes by means of a "loading bridge." The bridge will rest on a concrete shelf alongside the two-level terminal building and will pivot out to connect with the floor of the plane cabin.

The bridge, as seen in an artist's sketch, looks not unlike a railroad coach with windows and a corrugated steel exterior. Bids will be let out for its construction possibly before the close of the year, provided funds are in hand, and it is hoped the structure may be in operation by late 1956. United Air Lines is cooperating in the experiment.

The bridge will be tested over a period of at least a year, or until all "bugs" are ironed out, before additional units are ordered or installed. Stone shelf supports are in at all 16 gate positions in the present terminal building. ◈◈◈

Pentagon Readies New Directive On Payments to Contractors

Prodded by industry objections, the Pentagon is working up a new directive to replace the flat 105%-of-cost limitation it imposed Oct. 1 on payments to contractors under incentive and price-revision contracts.

The new proposal would prevent overpayments to contractors, the objective of the 195% decree. But in doing so, it would avoid the risk of financial hardship to defense suppliers. This was the chief criticism of the Oct. 1 directive.

The new order would require contractors to refund promptly to the government any payments they have received, including progress payments as well as payments on final delivery, which are in excess of their actual costs plus their negotiated profits.

• **This means** a supplier, with a contract providing for a profit of 6%, 8% or more, would run no danger of having his profit restricted to 5% of his costs for a period of possibly many months pending final price determination. He'd get his costs plus the full amount of his negotiated profit, but no more.

Here are the tentative provisions of the new directive:

In the case of new contracts and amendments to old ones providing for additional orders, contractors would be required to make a quarterly reimbursement to the government of the overpayments they estimate they have received, based on the use of the cost-plus-full-profit formula.

Where incentive and price-revision contracts are already in effect, contractors would be urged to refund their estimated overpayments on a voluntary basis. In no case will a voluntary remittance be held against the contractor when the time arrives for price redetermination or revision.

• **To make the refunds easier** for the contractors, the proposed directive provides that overpayments may be returned to the government on a lump sum basis. This means the contractor won't have to break down his reimbursements for each billing, although eventually this must be done when the target or final prices are redetermined.

Quarterly reimbursements may be based on estimates of overpayments, rather than highly-detailed "spy glass" audits, according to Pentagon officials. "The contractor would be doing informally what he would eventually have to do when his billing price or final price is formally revised," an official explained.

It's not certain that the new directive will be adopted with just these provisions. There's a difference of opinion within the Pentagon with regard to the application of the new control retroactively to old contracts in the case of follow-on orders, and some officials are worried about the underlying philosophy of the control device itself. They fear it represents a "cost-plus" concept creeping into regular fixed-price incentive and price-revision contracts, and that it may run afoul of the law.

The Pentagon ordered the 105% limit on payments to contractors after discovering evidence of substantial overpayments to defense suppliers. A study of the balance sheets of six aircraft and engine makers disclosed they held $200 million in government overpayments.

New Air Force Extrusion Press Goes into Service in Maryland

By HENRY T. SIMMONS

The first of the Air Force's two 8,100-ton extrusion presses at Halethorpe, Md., is now squeezing out structural shapes for aircraft and missiles under the operation of Kaiser Aluminum & Chemical Corp.

First customers for the Halethorpe extrusions are Lockheed, North American and Hercules Powder Co., a Dupont subsidiary. Their orders, plus others from Martin, Aerojet and Sikorsky, bring the Halethorpe backlog to 1.5 million pounds.

Lockheed is getting integrally-stiffened wing sections for its Electra and C-130 turbo-prop transports from the first of the two presses to go into operation. Massive wing spars are being squeezed out for North American's F-100 series of fighters, while Hercules is getting missile hull sections.

The Halethorpe presses, together with an array of pumps, furnaces, heaters, stretching and straightening equipment and other supporting facilities, are part of the AF heavy press program. Total cost of the presses and auxiliary facilities is $21 million, according to the AF.

• **Target of the heavy press program** is the elimination of the costly process of milling and assembling thousands of "bits and pieces" of aluminum into structural members for aircraft and missiles.

The big presses are designed to forge or extrude large, one-piece shapes requiring a minimum of milling and joining. Their products are lighter and stronger than similar shapes produced by conventional methods, and it's expected they will offer a substantial saving in machining and assembling time to airframe and missile makers.

While by no means the nation's largest extrusion facilities, the Halethorpe presses will be an important source of aluminum structural members for users in the eastern U.S. Built by Loewy-Hydropress, Inc., they're designed to extrude aluminum sections up to 1,400 pounds in weight from billets 26 inches in diameter and 58 inches long. Their rated capacity is close to two million pounds a month.

• **Each press is 126 feet long,** with 130-foot run-out tables. Each has two main cylinders capable of exerting a total of 5,400 tons of pressure, plus a mandrel cylinder capable of 2,700 tons.

The AF heavy press plant at Halethorpe occupies 317,000 square feet of floor space immediately adjacent to the 280,000 sq. ft. "light press" plant Kaiser bought earlier this year from the General Services Administration after operating it for five years under lease. The bulk of the space in the AF facility is taken up by $14 million in supporting equipment for the two presses. Their cost is about $7 million.

ROLL CONVEYOR SYSTEM automatically conveys mammoth 7,000-pound billets to weighing station adjacent to ingot discharger in Air Force-Kaiser plant at Halethorpe, Md.

Among the auxiliary items of equipment are four melting furnaces to turn out the big aluminum "logs" which go into the presses, four homogenizing furnaces to provide uniformity in the billets, a sawing machine, six electric induction heaters to prepare the billets for their journey through the presses, two enormous heat-treating furnaces, an aging oven and a variety of stretching and straightening machines.

Kaiser is operating the presses on a five-year lease from the AF. Under the terms of the lease, Kaiser pays a minimum rent of $500,000 a year or 7% of its sales from the facility, whichever is higher. Kaiser has no option to renew the contract, nor does it have an option to buy the facility.

Kaiser officials insist, however, that it would be highly impractical for the AF to bring another operator into the plant at the termination of its agreement because the facility is so closely linked to the adjacent Kaiser light press plant.

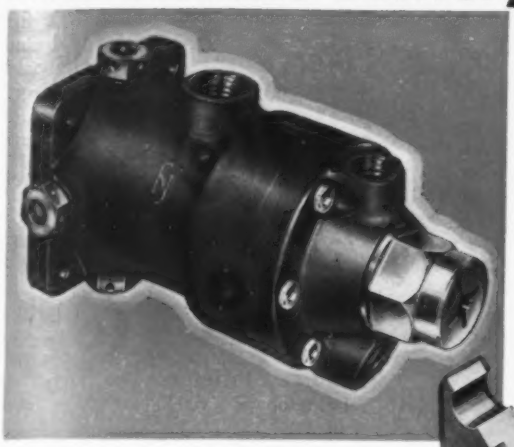
• **Terms of the Kaiser lease** are considerably stiffer than the company would have liked. It supervised construction of the plant on a no-fee basis and hoped to operate it on the more liberal terms enjoyed by Alcoa, Wyman-Gordon and other companies participating in the heavy press program. The rentals paid by Alcoa and Wyman-Gordon, for example, are 4% to 5% of their sales.

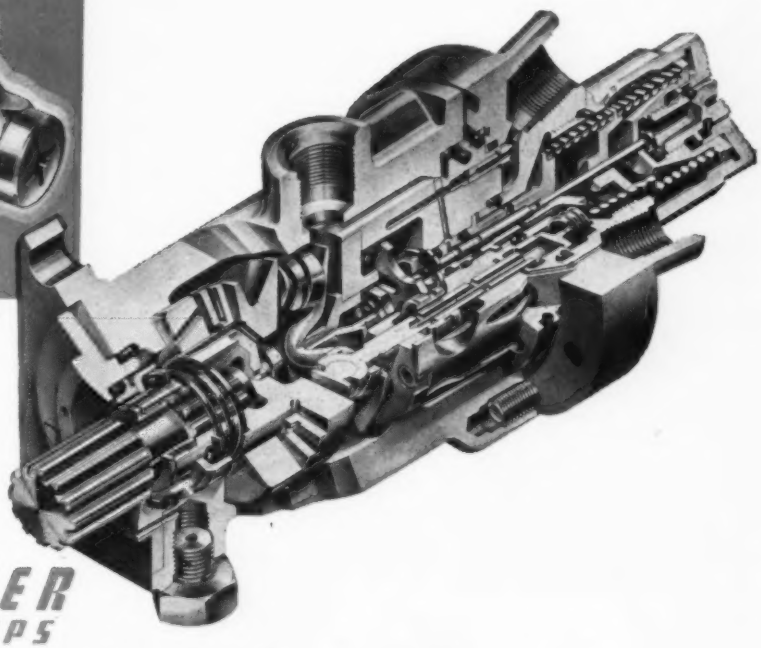
Kaiser was forced to submit the highly competitive bid for the plant after former AF Secretary Harold Talbott last year decided to invite other companies, including Harvey Machine Co., to make offers for it.

The AF heavy press program currently calls for 10 huge presses, six extrusion presses and four forging presses,

THESE TWO NEW EXTRUSION PRESSES are to be used in U.S. Air Force heavy press plant operated by Kaiser Aluminum & Chemical Corp. at Halethorpe, Md. In foreground are two 7,200-gallon pre-fill tanks of one press. In center, between presses, are induction heating units that prepare aluminum alloy billets for extrusion.

Are You One of the 728 Engineers Who Needs This New Variable Delivery STRATOPOWER HYDRAULIC PUMP





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at a total cost of about $237 million. Here's the line-up on the program at the present time:

• Alcoa—a 14,200-ton aluminum extrusion press in opertion at Lafayette, Ind., a 35,000-ton forging press in operation at Cleveland and a 50,000-ton forging press to go into operation shortly at Cleveland.

• Harvey Machine Co.—a 12,000-ton and an 8,000-ton extrusion press to start work in December or January at Torrance, Calif.

• Curtiss-Wright—a 12,000-ton steel propeller extrusion press in operation at Buffalo.

• Wyman-Gordon Co.—a 35,000-ton and a 50,000-ton forging press in operation at North Grafton, Mass.

Kaiser—an 8,100-ton extrusion press in operation at Halethorpe, Md., with a second to come into operation about the end of November. ◈ ◈ ◈

Kaiser Aluminum To Get 5-Million-lb. Plate-Stretcher

Kaiser Aluminum & Chemical Co. will have a new 5,000,000-pound aluminum plate-stretcher in operation at its Trentwood, Wash. rolling mill early next year, and at the same time it is enlarging its present 5,000,000-pounder to increase its power to 10,000,000 pounds.

The $1,250,000 expansion of Kaiser's plate facility at the Trentwood mill illustrates the growth of the new aircraft manufacturing technique of machining large pieces of heavy plate.

Kaiser's output of stress-relieved aluminum plate at Trentwood is 100% aircraft. It installed the industry's first 5,000,000-pound stretcher in 1951 and, according to D. A. Rhoades, vice president and general manager, is the largest source of supply for this material. Companies like Lockheed, Douglas and North American are heavy users.

Already machining single pieces of plate weighing up to nearly 4,000 pounds, the aircraft companies are now looking toward pieces in the 8,000- to 9,000-pound category. By machining integral skin and structural members from large single pieces of heavy aluminum plate instead of joining separate shapes and sheet, aircraft manufacturers produce stronger and lighter major components.

• **Rhoades compared** the use of an integrally-stiffened wing spar with one of conventional design in a current commercial plane (Lockheed's Super Constellation) in which 33,776 attachments, such as bolts and rivets, and 1,472 detail parts were eliminated for a total weight saving of 17% in each wing spar.

High quality aluminum plate, which has had "locked-in" stresses literally stretched out, is required to prevent distortion of the finished component during milling operations. Slabs of aluminum alloy measuring up to four inches thick, 100 inches wide and 50 feet long can be grasped at each end by the Kaiser stretchers for the 5,000,000—soon 10,000,000—pound pulls on the metal.

Related facilities being added with the stretchers include plate heating treating facilities capable of handling 2,000,000 pounds of metal per month. A new automatic ultrasonic testing device, capable of automatically detecting and marking defects as small as the diameter of a pin, also is being installed to insure the quality of the aircraft plate.

Frye Corp. Acquires Robertson Interests

Frye Corp. of Ft. Worth, which recently announced plans for development of the F-1 transport (AMERICAN AVIATION, Sept. 26, p. 26), has acquired assets of Robertson Development Corp. of St. Louis. Included in the deal are rights to the Robertson Skylark, a high-lift wing aircraft developed by owner J. L. Robertson.

President Jack Frye disclosed that flight tests with the Skylark have already been conducted under Army contract, resulting in some modifications.

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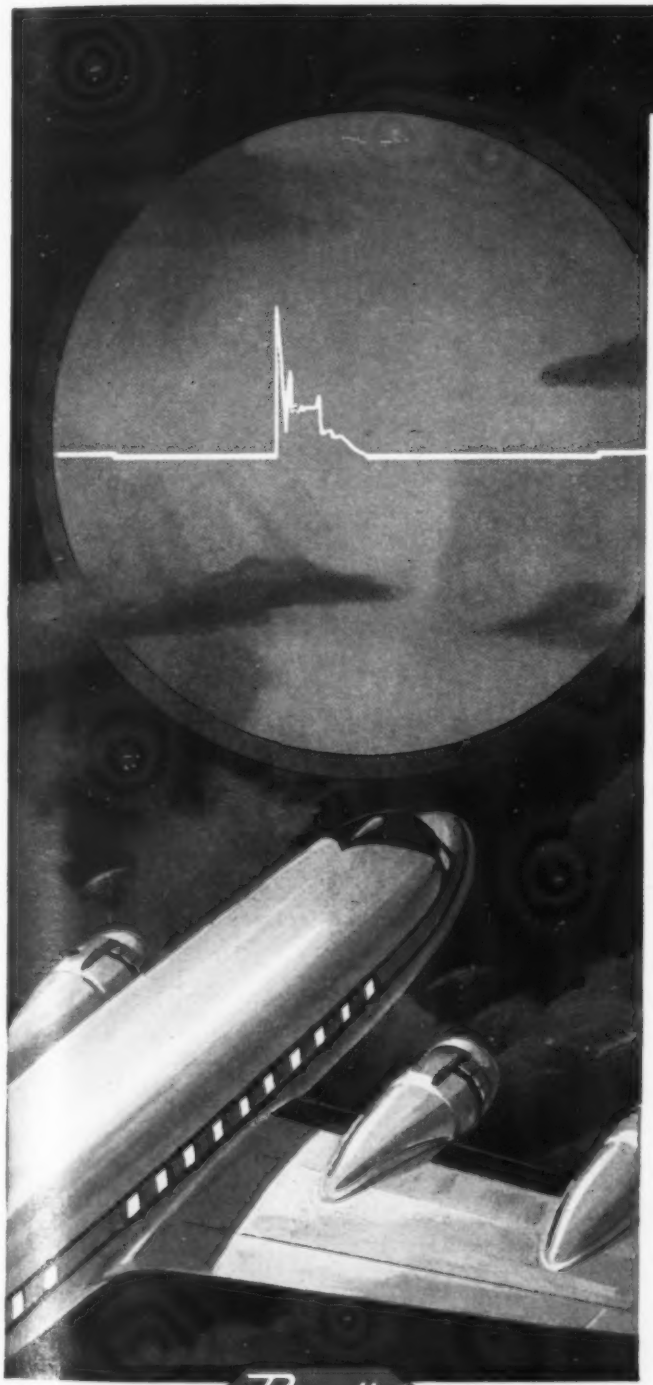

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Uncertainties Still Bar TACAN'S Adoption

Evaluation data discussed at symposium of experts and technicians in Washington discloses unknown factors remain.

By HENRY P. STEIER

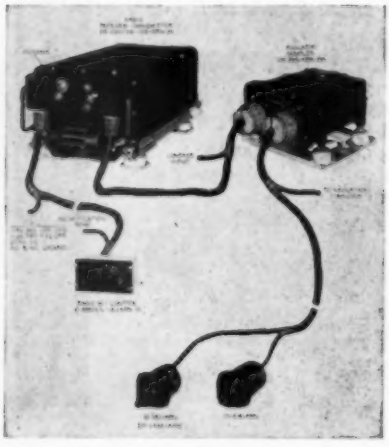
A look at the current technical status of the military system of tactical air navigation indicates that VOR has a long life ahead. Suitability of TACAN for adoption as a civil system remains indeterminate, it was generally conceded at the symposium on the new system held in Washington this month.

First public disclosure of progress being made by a three-group evaluation to clear away "uncertainties" barring TACAN's adoption was sponsored by the Air Navigation Development Board. Also industrial representatives at the meeting presented details of the general system, its ground and airborne equipment, and engineering developments being pushed for product and system improvement.

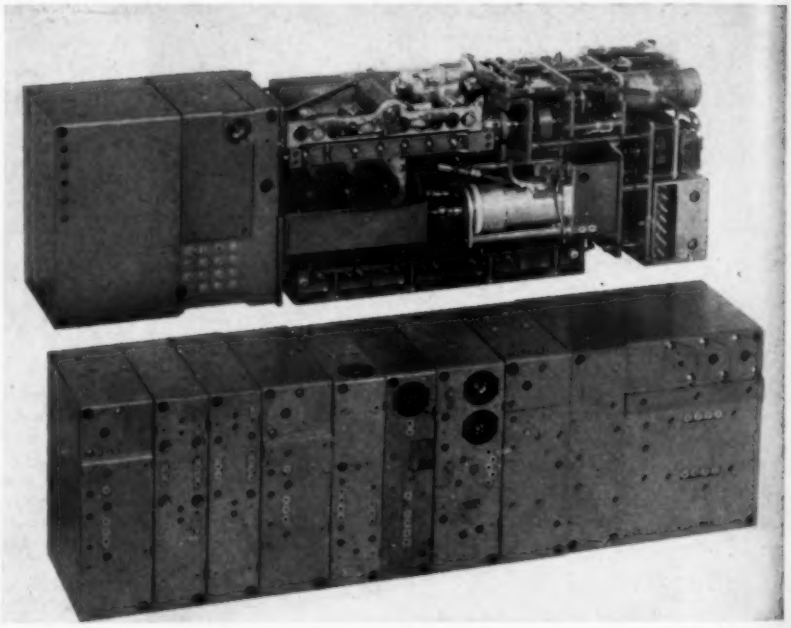
• **Organized to expose** evaluation data gathered to date and to disclose technical data on TACAN ground, airborne and test equipment, the meeting was attended by about 650 aviation representatives. Col. J. Francis Taylor, ANDB Director, said major credit for the system should go to John Loeb of the Navy's Bureau of Ships.

Current specifications were written during 1950-'51, and the Navy provided the ramrod of development for a system that would replace its aircraft homing system.

Two unknowns remained after the ANDB Advisory Committee No. 1, completed its "comparative analysis" of the VOR/DME and TACAN systems last January. The extent of interference between the TACAN and Secondary Radar Safety Beacon System, and a comparison between the number of interference-free TACAN channels against the number needed to provide coverage in continental United States remained indeterminate.



Units of the complete Collins TACAN system, with a coupler for integrating information from an off-course navigation computer, and new instruments designed to serve both TACAN and a long range (unnamed) navigation system.



Two units of Collins Radio Co.'s redesigned TACAN receiver transmitter ARN-21 (XN-10). The units are: RF unit, modulator, decoder system, distance measuring system, bearing measuring system and power supply.

ANDB Advisory Committee No. 3 was formed, after coordination with the Air Coordinating Committee's Nav Panel, to determine the coverage requirement.

Coverage Requirement Defined

As defined by Committee No. 3, the coverage requirement called for:

• **Route service** from 700 feet above the terrain to 18,000 feet above sea level on a basic system of routes connecting airports between which anticipated volume of traffic warrants such service.

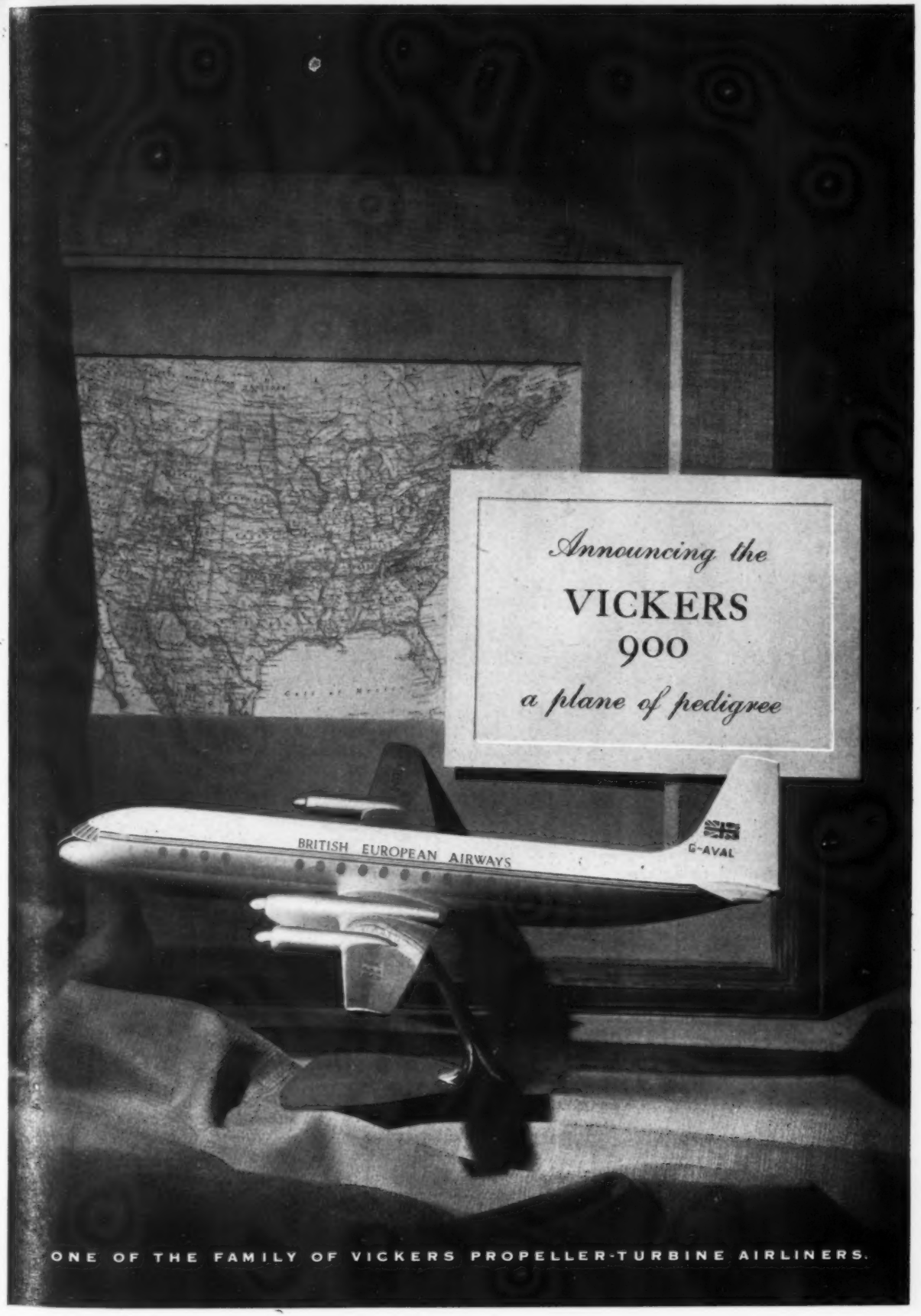
• **Route service** from 18,000 to 75,000 feet above sea level on routes where anticipated volume of high altitude traffic warrants such service. These and the low altitude routes will be served by facilities located so that radial courses transmitted by each facility will lie along the segment of the route served by each facility.

• **Area service** on a solid area coverage basis from 18,000 to 75,000 feet above sea level throughout the airspace above the continental United States.

In addition, the Committee was to prepare charts for extension of area coverage down to the earth's surface. This was needed so that channel needs would be available if such a plan became desirable at a future date. This plan was to be based on the rho-theta concept as well as for the use of an off-course computer. This is in line with the SC-31 philosophy (Air Traffic Control Committee report).

The ACC/NAV panel endorsed the 700-to-75,000-foot plans. Plans for coverage to the earth's surface were assigned to CAA and the Navy. At the time the existence of the plans were announced, ANDB emphasized that "the results of the coverage committee are significant only when applied against the proved performance of the navigation system under consideration."

• **The job of channel** requirement determination was given to the National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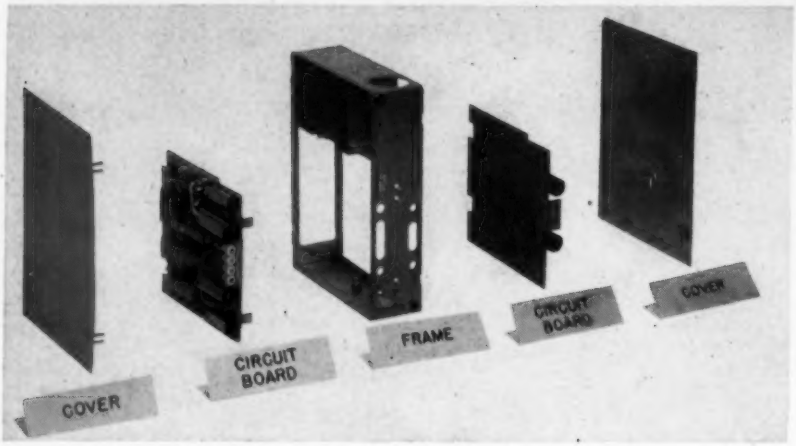


Mechanical construction of Collins's ARN-21 (XN-10) modularized TACAN receiver-transmitter. Circuit Boards are designed for automatic assembly.

Bureau of Standards as a "disinterested and technically qualified group." In the meantime, Airborne Instruments Laboratory was working on a problem closely related to the number of interference-free channels available. As a result, AIL accepted a contract for the determination of available channels, and estimated its determination would be completed by Nov. 1, 1955.

Although the NBS had the coverage requirements basic to their assigned task, the precise performance of TACAN was needed in order to determine channels required, together with consideration of ground equipment whose power ratings were designed for ranges of 200, 100 and 30 miles.

To insure that data supplied to NBS were unbiased, it was decided that additional data were needed to "confirm previous measurements." The data were to be collected by the Federal Telecommunication Laboratories, with AIL and the NBS observing how the data were derived. According to an announcement made at the symposium by D. K. Martin, deputy director of ANDB, who was chairman of Committee No. 1, the NBS study has been delayed because of power failures and similar technical difficulties during FTL tests on equipment characteristics.

Propagation Aspects Discussed

• **Meanwhile, going on** the basis of "assumed values of separation in distance between stations assigned to a common channel and of co-channel signal-to-signal protection ratios, NBS proceeded to apply information on the propagation aspects of a system operating in the VHF band used by the VOR system, and to intensify studies of the UHF band used by TACAN.

Martin T. Decker of NBS discussed some of the propagation aspects in the 1,000 mc region, admitting that the statistical data presented "could be applied to any 1,000 mc system." Selecting a frequency of 1,046 mc for consideration, Decker showed that, based on information now available, the mathematical probability for service from a TACAN facility at 1,046 mc to a receiver 120 miles away at 17,000 foot altitude is 0.999.

The higher the altitude the less miles distance that can be covered for a 0.999 probability. At 40,000 feet the distance is about 175 miles. Involved in these predictions were antenna height and signal losses in the antenna structure. The data presented had no relationship to actual system tests.

• **Some results** of evaluations of TACAN'S siting problems, equipment and systems accuracy being conducted on a continuing basis by Airborne Instruments Laboratory, CAA, Naval Air Test Center and Wright Air Development Center were discussed. Describing AIL's tests for ANDB's VORTAC committee as a "small scale test," J. S. Pritchard, said cross-talk between the 15 and 135 cps modulated signals in AIL's equipment made changes necessary on a "breadboard basis." These changes, he said, "have no reference to possibilities for production equipment."

Pritchard said tests at five sites were run. Summarizing results from the sites and referring to VOR's "traditional accuracy" as 3 to 5 degrees, Pritchard said for the range of sites investigated most of AIL's data showed accuracies within 2 degrees. Both VOR and TACAN have the same magnitude of polarization error.

At sites where obstructions interfere with the signal, scalloping occurs and the error goes up, although at all sites investigated the TACAN error was lower than VOR's. The theoretical 9-to-1 gain in accuracy possible with TACAN is not achieved, although there is a gain of greater than 1. Variation in power supply frequencies causes bearing errors.

CAA Expert Reviews Findings

• **For the CAA,** D. M. Stuart of the Technical Development and Evaluation Center cited data obtained from two sites at Indianapolis. Both sites were on fairly flat terrain, and involved checks on "what's wrong with the system, not what's good about the system," according to Stuart.

Flying around the ground station at a radius of 6 miles, 1,000 foot altitude, CAA found azimuth errors of plus 2½ degrees to minus 1½ degrees. A patch of woods existed at 144 degrees azimuth. At that angle, and flying a radial course the airborne system went into azimuth search at 24 miles for an altitude of 1,500 feet. Bringing the ground equipment closer to the woods caused the airborne equipment to go into search beginning intermittently at a 12-mile point and becoming permanent at 36 miles, the horizon point from a 1,000-foot altitude.

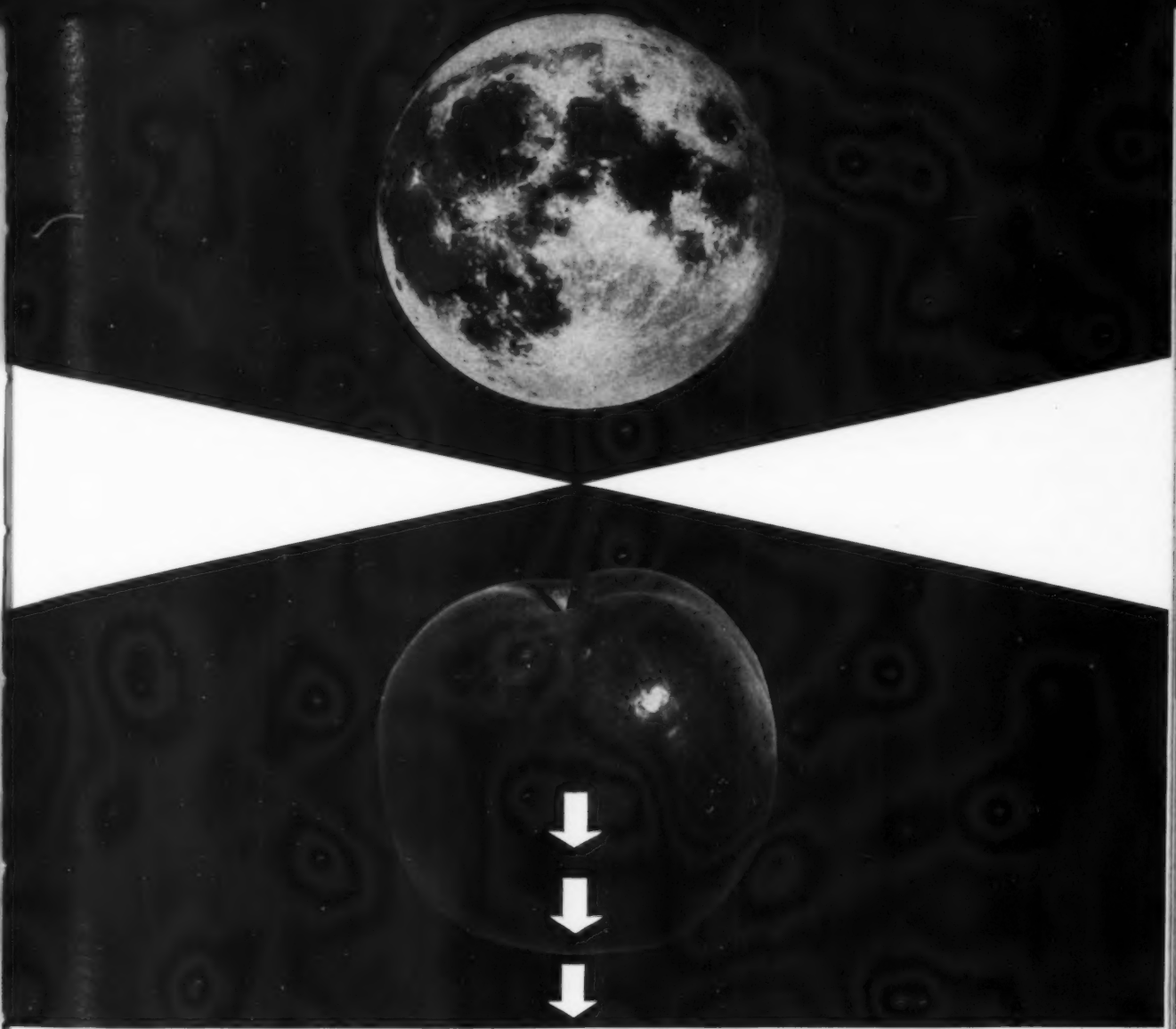
At 12,000 feet, search started at 60 miles and went on up to 130 miles where the signal was lost. These tests were with mobile equipment a few feet above ground. At antenna heights of 95 feet, Stuart said the system behaved quite respectably out to a range of 130 miles at a height of 12,000 feet.

• **Navy tests** over ground-based stations showed total system errors, with GCA radars installed close by, to be about 6 degrees. With early model equipment, they found site errors were plus 1 to minus 2 degrees. With late model equipment error was plus or minus .75 degrees.

In general, the Navy test showed the coarse and fine signal system is more complex but inherently more accurate. The azimuth determination from the fine signals was found to be less sensitive to siting conditions than a "similar single lobe system"; also that azimuth errors may be reduced by equipment improvements.

Air Force findings that were discussed were based on tests in Alaska where ground stations are operating. Operating at 40,000 foot altitudes, and using a B-57 bomber for the tests, AF tests showed "good coverage at 40,000 feet" out to a distance of about 200 miles, and existence of a cone of confusion above the transmitter of about 110 degrees. DME quit at 196 miles. At 40,000 feet, on flight tests with an F-102 fighter, azimuth accuracy was said to be .5 degree.

• **Often mentioned,** but without data being presented, was the question of interference between the Secondary Radar Safety Beacon System and TACAN. The beacon, requiring space in the spectrum at 1030 mc and 1090



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mc, takes a big bite out of the reported 126-channel capability of TACAN. These frequencies are in ground-to-air and air-to-ground parts of the TACAN spectrum, occupied by channels numbered 6 and 66.

Numerous factors plague any evaluation of beacon interference. What width guard band is needed to prevent interference? Based upon current designs for adjacent channel guard bands, 34 bands might be taken from the 126 supposedly available. Status of this study was not disclosed. Upon it depends how far NBS can get with their work.

Regarded as of major importance by the ANDB is the question of how well TACAN equipment may perform in the period of 1965-1970, dates set by the ACC as "guaranteed" by the ACC for continuance of VOR. This involves consideration of airborne and ground equipments. Airborne sets capable of fitting all user's needs must be available, and there is no doubt but that capability of the present system can be improved—system and equipment-wise.

Significantly, Al Winick, head of Navigation Branch, Aeronautical Division, Bureau of Aeronautics, announced a "dynamic program" of TACAN product improvement and new approaches to basic problems. In 1952, BuAer gave Collins a contract for a "fresh approach" to critical circuitry problems. Delivery of the newly designed equipment to the Navy is expected this month. The Collins airborne system, designated ARN-21 (XN-10), consists of an RF unit, modulator, decoder system, distance measuring system, bearing measuring system, and power supply.

• **The Collins approach** was to "modularize" construction. A new system of directed flow air cooling is used "for the first time," according to John McElroy, assistant director, research and development, Collins Radio Co. Circuit components are arranged on a grid line layout basis for automatic assembly. The design calls for bearing accuracy of about plus or minus 0.5 degree from minus 55°C to plus 100°C.

McElroy says the 12 modules comprising the new equipment weigh 45 pounds; 81 tubes are used, but McElroy says it should become a "less than 25-tube device with transistors where they can be used."

The X-10 was planned to overcome many of the shortcomings of present equipment, such as sector lock-ons, power supply problems, and installation effects on signal losses in the distance measuring portion.

The design may well be a step toward equipment suitable for airline use. The Collins philosophy, as stated by McElroy, is that "there are precedents for getting around military red-tape," and "watch industry in the months ahead and you'll see high quality light weight equipment that will perform equally well for civil and military uses."

• **The way in which** TACAN fits into the AF continental defense network known as SAGE has not been publicly established. However, AF development of TRACALS (military terminal air traffic control approach and landing system) has been mentioned by ACC as being directly concerned with SAGE information, and that a Common System of air traffic control should be compatible with TRACALS.

That localizer service has been integrated experimentally with TACAN was indicated in an announcement by P. E. Ricketts, Rome Air Development Center, to "fellow TACANIANS," that the first automatic landing was accomplished at Rome, N. Y. He said a plane flying a radial course using TACAN information was brought to the "decision gate" and brought in automatically by newly designed equipment.

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Experts Disagree on Design Features Of Airborne Electronic Equipment

What are the differences in design features required for military and civil airborne electronic equipment? If differences exist, what are the reasons?

A symposium that highlighted these matters was featured at the recent Annual East Coast Conference on Aeronautical and Navigational Electronics sponsored by the Institute of Radio Engineers at Baltimore, Md.

The philosophies of an eight-man panel showed a wide divergence of opinion on whether the differences are basic to the user. Based upon a set of factors to be considered, the pros and cons of military, air transport, private flyer and manufacturer viewpoints were heard.

• **The eighteen design** factors considered were listed as a guide for discussing the effect they have on engineering designs and equipment users. Norman Caplan, Bendix Radio Division, was the moderator.

The factors that can influence equipment design were listed as:

- Size
- Weight
- Cost
- Performance
- Reliability
- Life
- Interchangeability
- Power consumption
- Ease of maintenance
- Type of mounting
- Environment
- Operational use
- Universality
- Customer preference
- Logistics
- Instruction book
- Test equipment
- Procurement

To illustrate the cross-relationship

Ram-Air Emergency Power Package

RAM-AIR TURBINE-DRIVEN emergency power package (above) developed by Marquardt Aircraft Co. for Navy's Chance Vought XF8U-1 supersonic day fighter weighs less than 50 pounds. System is of the "drop-out" type in which an air turbine rated at 25 horsepower drives a hydraulic pump and electrical generator to supply power for emergency operation of flight control and communication systems at all speeds.

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of factors, Caplan said antenna weight was a good example of how a small part affects overall weight and cost considerations. According to engineering opinion, he said, one pound of airborne equipment needs 10 pounds of aircraft to support it.

Ludlow Hallman, Wright Air Development Center, emphasized the importance of the word "extreme" in describing Air Force requirements. Reliability is, he said, achieved in different ways by different users. For the Air Force, using no established routes, no duplicate equipment, and operating fighters and bombers under different conditions in all parts of the world, design requirements are usually special.

Imperatives for AF users are easy maintenance and test procedures. The unitized or modular approach to circuit design is the best way to do the job, Hallman said. This approach together with "go-no go" test equipment makes breakdowns easy to fix.

Al Winick, Bureau of Aeronautics, U.S. Navy, said he could not "equate cost with combat effectiveness." Regarding reliability, he said that since more dense equipment is being called for, reliability may even go down, and designs may be forced to use vastly improved cooling techniques. He said in checking Aeronautical Radio Inc. specifications he found their temperature and humidity requirements "stacked up" pretty much the same as Navy's. Because of aircraft carrier problems, such as catapulting, the shock problem was different than that for air transport aircraft equipment.

Winick believes ease of maintenance is confused with reliability. Plug-in assemblies, he thinks, are more unreliable because there are more wires required to connect the plug-in units.

• **Some special problems** of the Army's air arm were discussed by Lt. Col. John L. Wilson, U.S. Army Signal Corps. He said the Army has been using commercial equipment and will continue to do so when operating requirements are met. Their job is primarily tactical, and emphasis is placed on that and common system needs since the Army also flies the airways.

Of first importance to the Army is weight and size. Army dependence upon light aircraft and helicopters poses a critical weight problem for electronic equipment. Even ounces of weight are considered important, Wilson said. He believes electronics cost should be proportional to aircraft cost in Army aviation budgeting.

The Army has been using VHF equipment for visual flight rule flying, but now that they are flying by instrument flight rules they are having trouble with the limited number of channels available in the VHF band. The Army is converting to UHF for voice communications but finds the weight of present equipment prohibitive in many aircraft.

• **Speaking from** the business and private flyer point of view were A. Rufus Appelgarth, National Aeronautical Corp., and Max Karant, Assistant General Manager, Aircraft Owners and Pilots Association.

Appelgarth said the need of business flying is for more complete equipment than the air carriers require, since much flying is away from airways under a wide variety of geographical conditions. They need reliability of a high order because weight restrictions prohibit a "redundancy" (dual equipment) approach in the average case. Also, there is no rigid periodic maintenance procedure. "They wait until trouble develops," Appelgarth said.

Karant cautioned against the "tendency" to a "Jaguar in every garage" philosophy that seems to be part of equipment planning. From his point of view, he said, "if it weighs one pound and costs one dollar, and has 100 percent reliability" it is suitable for private flyers.

• **From the airlines'** point of view, William T. Carnes, Jr., Aeronautical Radio Inc., said the word "conservative" was emphasized in the design of new equipment. The airlines, he said, have the "fortunate" ability to build up flight hours in the order of 3,000 per year for radio equipment and so must consider the reliability factor and maintenance costs very seriously. Also important is design for universal application to many types of aircraft, since this keeps equipment costs down.

Another factor in the cost control is the practice of writing ARINC specifications for equipment. In this way the manufacturer knows something of what is expected of size, weight, mounting and performance before he builds equipment. Also, for future aircraft such as the Lockheed Electra, Boeing 707, Douglas DC-8, the environment and technical characteristics plans for ARINC described equipment are known to airframe builders.

Carnes said that although much surplus military equipment was used in airlines planes, the equipment "doesn't perform like civil gear. Civil gear is better performing."

From one manufacturer's viewpoint, if equipment functions and construction are considered, little difference is required between military and civil designs. J. C. McElroy, assistant director of research and development, Collins Radio Co., believes that for a civil transport and a bomber there's little difference in requirements, aside from actual specifications. For example, he said, weight and volume are important to all jet aircraft operators. McElroy predicted that in the months ahead the aviation industry will see equipment of light weight and high quality that will perform equally well in military and civil aircraft.

"After all, military aircraft are in a sense, a business operation" that must stand the scrutiny of the taxpayer, McElroy said. The Defense Department is becoming more conscious of economies inherent in the system design and packaging approach.

Industry, McElroy said, should be given an opportunity to satisfy military requirements with industry's own resources. Progress in this direction, he indicated, was shown in release of the Air Research and Development Command's secret technical planning program to selected manufacturers.

◆ ◆ ◆

Britain's Victor Leaves Mark in Sky

Handley Page's four-jet crescent-winged bomber, powered by four Armstrong Siddeley Sapphire engines, cruises at 700 mph at altitudes of 55,000 to 60,000 feet.

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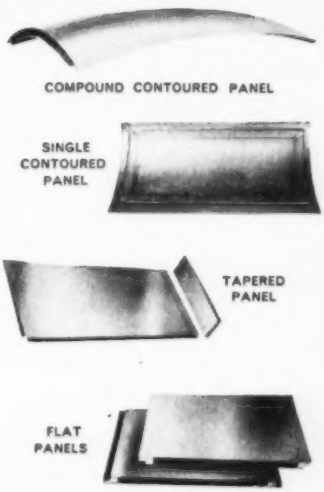

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Korea Jet Ace Dominates USAF Weapons and Rocketry Meet

Maj. Frederick Blesse scores 946 points in fourth annual meet, sweeping all events; value of close teamwork shown.

INDIAN SPRINGS, NEV.—Maj. Frederick C. Blesse, a 31-year-old double jet ace of the Korean war, almost turned the day-fighter phase of the U.S. Air Force's 4th annual Fighter Weapons and Rocketry Meet into a private party for himself.

He was high overall individual with a score of 945.86 points out of a possible 1,600. This score far exceeded the 852 points achieved by Capt. Charles C. Carr in winning last year's top individual ribbon.

He made a clean sweep of all events by chalking up the high individual score in each one. These included: (1) air-to-air at 20,000 feet; (2) air-to-air at 30,000 feet; (3) high-angle bombs and rockets; (4) low-angle skip-bomb and strafe.

Maj. Blesse's high score was a major factor in the Air Training Command's overall team victory for the second consecutive year. This 3595th Flying Training Wing from Nellis (Nev.) Air Force Base, flying North American F-86Fs, racked up a total of 3170 points out of a possible total of 6400.

• **Maj. Blesse's sweep** might indicate that the gunnery meet is largely a matter of individual skill. Actually, it reflects the value of close teamwork. An effective example took place during the second day of firing.

Crewmen from the 450th Fighter Bomb Wing from Foster Air Force Base, Tex., representing the Tactical Air Command, knew something was wrong when Lt. Col. J. P. Hagerstrom and Maj. C. A. Curtin, both aces, had scores of only 4.25 and 2.0 in first-day firing. Working until midnight, they found Col. Hagerstrom's bug to be a defect in the sensitivity unit, causing the pilot to overlead by 200 feet. A loose connection caused intermittent information to be sent to Maj. Curtin's sight. Second day scores: Hagerstrom, 20.75; Curtin, 14.25.

Maj. Frederick C. Blesse, member of the Nellis Air Force Base day fighter gunnery team, was high individual scorer in the meet at Indian Springs, Nev. A double ace of the Korean war, Maj. Blesse shot down nine MIG-15s.

"Credit our maintenance men," said Lt. Robert Grenninger, team armament officer. "They've been putting in 18-hour days since we left Foster."

• **The rules are set up** to require this team-work. Combat readiness is a keynote of the gunnery meet. Each team comprises six air crewmen and 25 ground crewmen, operating six aircraft. Only four, however, actually do the shooting as a team, the other two being in the pinch-hitting category. A pilot who fails to take off on schedule due to maintenance failure loses his place and the points for that event.

Scene of this year's gunnery meet was Indian Springs, an outpost on the Nevada desert about 45 miles from Nellis, the great crew training base billed as the world's busiest airfield because of its 30,000 landings and take-offs a month. The second section of the competition, the rocketry division, took place at Yuma, Ariz. Air Force Base.

The gunnery meet may never surpass the national air races as an aviation attraction for the public. But it would if someone could figure out how to hold it in a ball park and pack it into about three days. It's a real good show.

• **The Air Force** put up a couple of sets of temporary bleachers at Indian Springs and a few folk found their way into the seats to watch the Air Force's sharpest gunners and bombers in low altitude action. It also made an effort to interest the daily press, but not many showed up. Perhaps, in this day and age of DC-7 and Super Constellation convenience, the press has come to take a dim view of C-119s—used on the Nellis-Indian Springs airlift—as transportation vehicles for humans.

In time, with good promotion and publicity, the Air Force might be able to build up a substantial public and press interest in an annual competition in which the events are consolidated at one point and then telescoped into a grand finale championship for the public end of the show. The combination of the gay hotels and casinos along the fabled Las Vegas strip and the clear, bracing air of the Indian Springs desert in the morning should be attractive to visitors, too. Hot ammo and hot dice, you might say.

• **There's no doubt** of the gunnery meet's top rank within the Air Force itself. At all hours of the day, officers and airmen clustered around the big scoreboard at Nellis where the points were posted. Interest runs very high.

The low altitude portions of the

These pilots carried the Far East Air Forces to the championship in special weapons delivery phase of 1955 USAF jet fighter and gunnery weapons meet. Left to right: Col. G. L. Pritchard, (team captain), Lt. M. E. Lilly, Lt. Col. E. B. Edwards, Lt. J. M. Jeffries, Lt. D. L. Richardson and Lt. E. T. Atkinson.

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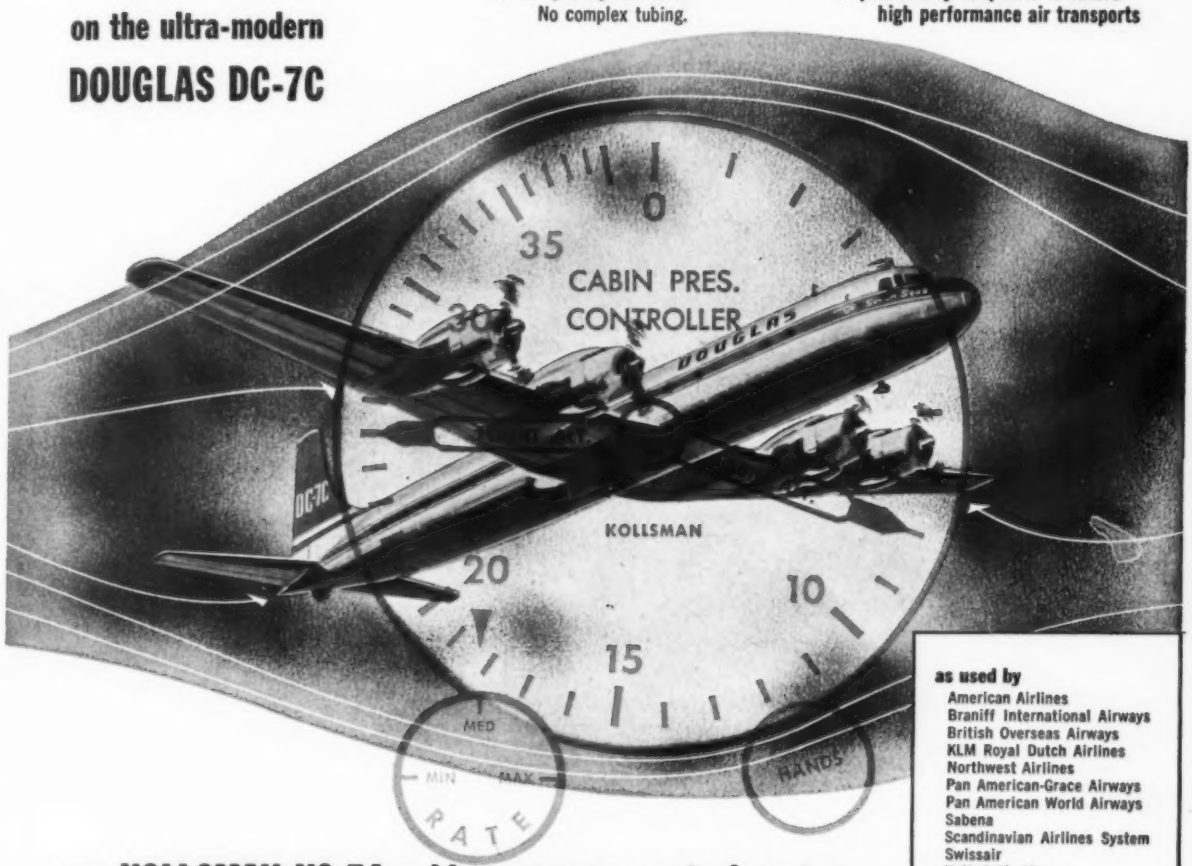

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competition—skip bombing, panel strafing, dive bombing and rocket firing—unfold in full view of spectators on the ground. These make a good show—especially when a pilot really latches onto a target with a three-pound practice bomb and a pyramid simply disappears.

It takes field glasses to catch the silver specks of swept-wing fighters making their passes at the tow targets at 20,000 feet and again at 30,000 feet. This year's meet, incidentally, marked the first time 30,000-foot missions became practical in competition. Last year, the high air-to-air altitude was 27,000 feet.

• **The tow "rag"** is a 35-pound, 6x30-foot plastic mesh towed 1,000 feet behind an F-86H. These tow pilots play a part, too. One, Capt. Thomas E. Daems, flight commander of a combat crew training squadron at Nellis, was killed when his plane crashed and burned on takeoff with a tow.

Sometimes target malfunctions are annoying. A spell of target trouble midway in this year's meet necessitated a number of makeup missions—overtime for both pilots and ground crews.

North American F-86s predominated in the day-fighter phase of the gunnery meet, with four of the six competing teams flying F-86Fs and one flying F-86Es. The sixth team flew Republic F-84Fs.

This marked the first year for the Curtiss-Wright J65-powered fighters in the meet and, flown by the Strategic Air Command's 508th Strategic Fighter Wing from Turner Air Force Base, they gave the winning ATC F-86F team a race. It was the second high overall team with a total of 2769.5 points. It even beat out the ATC team for first place in the air-to-ground competition, but dropped back to fourth place in the air-to-air shooting, which was won by the victorious ATC unit.

• **The Air National Guard** team, flying F-86Es, finished in second place in the air-to-air events, and its leader, Lt. Col. W. E. Williams, brought more distinction to the group of citizen flyers by beating out the ATC team's Col. W. J. Grumbles for high team captain in the day-fighter phase.

The guard unit's accomplishment was counted all the more remarkable because it actually is a Lockheed F-80 group and had won the ANG shoot-off flying F-80s. Only two of its pilots had ever flown F-86s before and none of its maintenance personnel had had any experience with the North America planes. Their F-86Es were loaned to them from other organizations so that they might be outfitted with more modern equipment.

(*Continued on page* 46)

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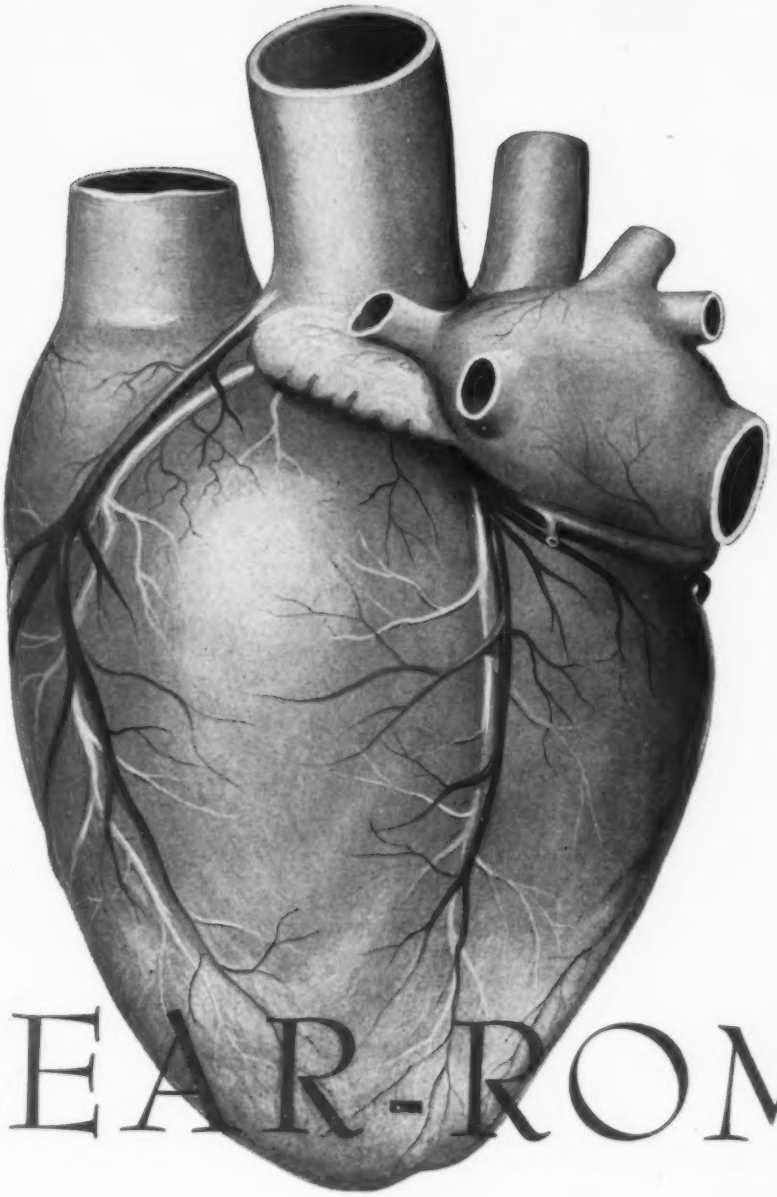

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(*Continued from page 42*)

Lt. C. K. Overstreet of the SAC team gave the ATC ace, Maj. Blesse, his closest competition for high individual honors, but an ATC teammate, Capt. H. R. Charlton, was right behind. Lt. Overstreet was second behind Maj. Blesse in air-to-ground and Capt. Charlton was second in air-to-air.

The Far East Air Force team captained by Col. G. L. Pritchard and flying F-84Gs walked away with top honors in the special weapons delivery phase of the Indian Spring's meet to win the Thomas B. McGuire Trophy. "Special delivery" is a classified phase of the gunnery meet and was staged on a closed range. The U.S. Air Forces in Europe team was second. High individual aggregate scorer was Lt. Col. E. B. Edwards of the FEAR team, with Lt. C. E. Adams of the USAFE team second.

Lt. Col. Edwards also was first place winner in the low-angle bombing without identification point. Col. R. C. Franklin of the USAFE team was first in the low-angle bombing with identification point and Lt. A. A. Crosby, Jr. of the Air Training Command racked up the high dive bombing score in this classified event.

Lockheed Aircraft Corp. threw the victory party at the conclusion of the rocketry phase of the meet at Yuma, Ariz. For the second straight year Lockheed's F-94C emerged on top in the interceptor competition. Last year, a Crew Training Air Force team captured the first rocketry meet flying F-94Cs. This year, an Eastern Air Defense Force unit from Roslyn, New York, flying the Lockheed equipment, won the championship and the Maj. Richard Bong trophy with a score of 11,600 out of a possible 24,000 points.

The EADF triumph was particularly satisfying to Lockheed because it was the only one of eight teams in the rocketry meet flying F-94Cs. North American Aviation was represented by five teams flying F-86Ds and Northrop Aircraft by two units operating F-89Ds.

An F-86D unit, representing the Air Training Command, finished in second place with 10,600 points and an F-89D group, from the Northeast Air Command, was third with 9,000 points.

Individual honors were shared by Col. B. H. King of the winning EADF team and Lt. A. F. Dennis, a member of the Air Training Command group, both scoring 4,600 out of possible 6,000 points. Col. King's radar observer in the two-place F-94C was Lt. Robert S. Goad.

• **The rocketry phase** of the fighter weapons competition points up the lead collision course concept for interceptors made possible by the introduction of the fire-control system. All of the interceptors in the meet were equipped with electronic interceptor systems produced by Hughes Aircraft Co. and the firings—at 18,000- and 30,000-foot levels—were made "under the hood." These fire control systems—E-4 in North American's F-86D, E-5 in Lockheed's F-94C, E-6 in Northrop's F-89D—are basically the same, but each is tailored for installation in the particular model of aircraft.

Six Nellis AFB pilots comprised the winning Air Transport Command aircrew team which won day fighter championship title for second consecutive year in annual gunnery meet at Indian Springs, Nev. Left to right: back row, Capt. Brooks J. Liles, Col. W. J. Grumbles (team captain), Maj. Frederick C. Blesse; front row, Capt. H. R. Charlton, Capt. Calvin Davey, Lt. Thomas Tapper.

Rocket firings are in shotgun patterns and, since the meet is intended as a competition between crews, all planes used 24 "Mighty Mouse" 2.75 rockets for record firing. This was due to the fact that the North American F-86D rocket rack carries 24 missiles. Lockheed's F-94C normal armament load is 48 and Northrop's F-89D holds 104 in wing pods. Because of the explosive capacity of a 2.75 rocket, anyone shot in the 45x9-foot radar-reflecting target is counted a hit.

More even than the gunnery events at Indian Springs, the Yuma rocket shooting illustrates the value of team work. The interceptor crews are bigger, 50 men, and radar ground controllers have a direct bearing on scores. Lt. Arthur F. Dennis, for example, credited his controller, Capt. Richard Phillips, with doing more to keep him out in front in the scoring than he himself did.

Expressions of satisfaction by top Air Force brass over this year's competitions were unanimous. Brig. Gen. Arno Luehman, USAF's recruiting head, summed it up as well as any: "Unlike air shows, this is no parade. Lessons are being learned here. They're shooting real bullets and firing real rockets." ◆◆◆

Convair 340 to Get New Door Mechanism

Convair is making available a new rear-service door hinge and locking mechanism with several additional safety features for 340 and future 440 aircraft.

Positive door closed indication is provided by an auxiliary mechanism of the drive-pin type which permits complete actuation of the locking handle only if all door hooks are correctly engaged in their yokes.

The shape of things to come

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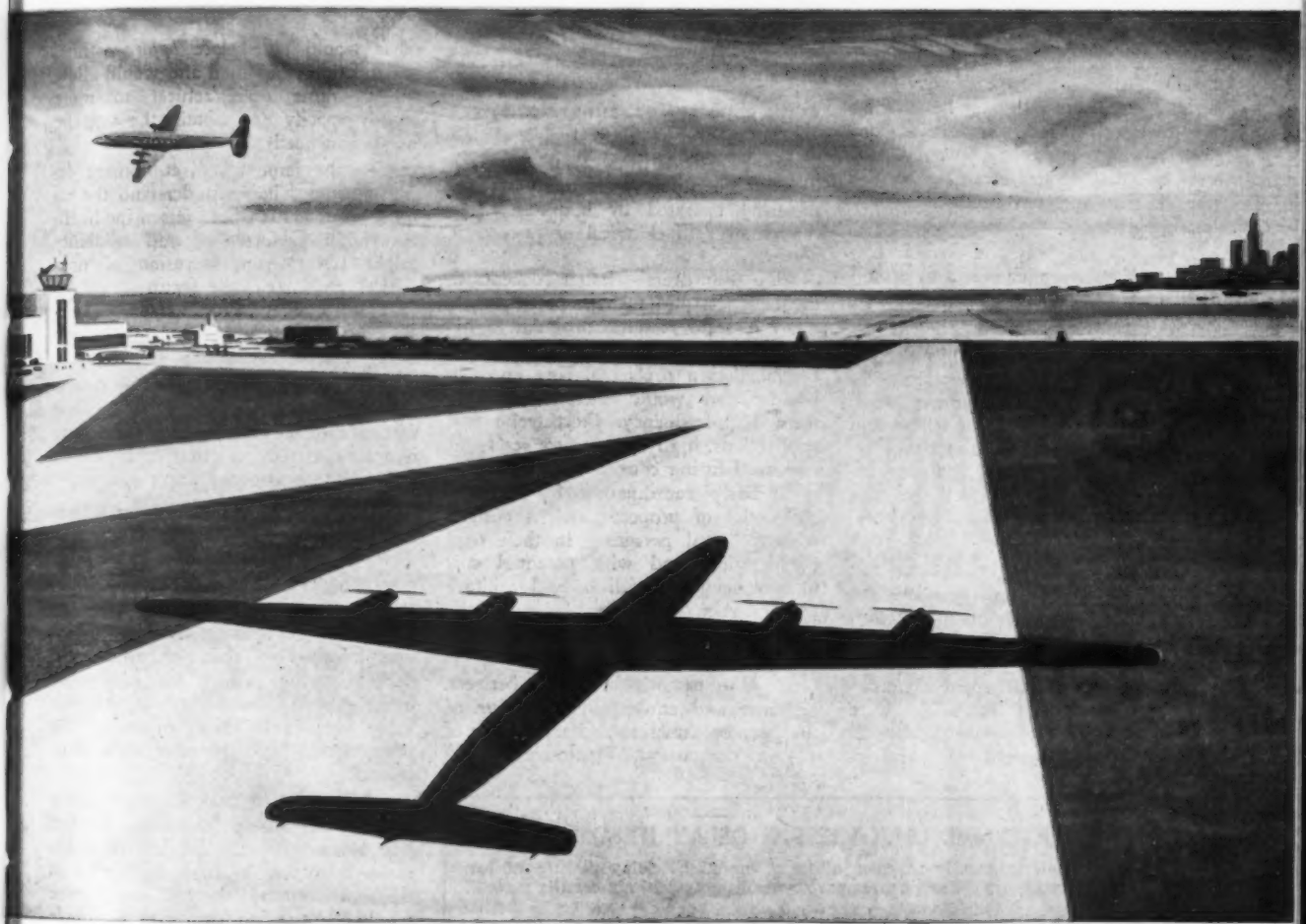

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Needed: New Aircraft Hydraulics Designs

Jets and turboprops require new approaches, airframe and manufacturers' reps agree at Vickers 1955 Transport Hydraulic Conference

By JOSEPH S. MURPHY

DETROIT—Transport aircraft hydraulics engineers may still be holding their own against stiff competition from electrical and pneumatic-powered systems, but that doesn't mean the picture won't change radically in the next few years.

At least one thing is certain. Hydraulics designers can't expect to extend their past successes into new jet and turbojet transports via a simple carry-over of piston transport design practices.

The reason: hydraulics systems in operation today have too many weak spots that are causing flight delays and high rates of premature component removal, and are generally reducing reliability of operation. All will be even less tolerable in expensive, high performance jets.

• **Just how strongly** airlines feel about these shortcomings was brought sharply into focus early this month during the 1955 Transport Hydraulic Conference sponsored by Vickers, Inc.

Airframe and equipment manufacturers representatives attending were warned to cease covering up the "ignorance factor" with system mass, and instead base future designs on *known data* alone.

Hartline's Recommendations

If this doesn't happen, predicts Trans World Airlines' Paul A. Hartline, within a few years many systems presently operated by hydraulics will change over to electrical or pneumatic power.

To gear overall design concepts to the new jets and turboprops he urges:

• **A team research program** in hydraulics to find the answers to fundamental design problems. Key areas to be explored would include dynamic seals, high-frequency, short-stroke seal applications, high temperature seals and improved fitting connections.

• **Early coordination** by airframe companies of proposed system designs with technical personnel in their own organization, and with potential customers including airlines and military services. Aim here would be to get the benefit of additional experience, know-how and constructive criticism.

• **More extensive discussion** between airframe and equipment producers of the purpose, function and application of a new component. This exchange of ideas would take place *before* a final specification is adopted and would allow the airframe manufacturer to more readily specify and obtain the unit he wants and needs.

By the same token, equipment designers would better understand the requirements. This would lessen the likelihood that performance and reliability might suffer from inclusion of non-critical and irrelevant features.

Here's where aircraft hydraulics designers are falling down on the job today, says Hartline:

• **Inadequate System Failure Analysis**—In one instance a quantity-type fuse was used to prevent loss of the complete hydraulic system in event of failure or leak in the emergency brake system.

It proved to do the job for a line-rupture type of failure, but with the slow leak generally experienced, the emergency and normal system would fail simultaneously.

In another instance, a charging valve was installed so that, except for the period during which the emergency brake system was being charged, the valve remained "OFF," isolating the main system from the emergency brake system.

• **Inadequate Back Pressure Analysis**—On one aircraft experience showed that when hydraulic services were operated resulting in high flow rates in the return system, the fuel dump valve would operate inadvertently. A simple check valve in the dump valve return line corrected this.

• **Inadequate System Interconnection Analysis**—One basic brake system was arranged so that the accumulators stored the emergency brake energy and the aircraft was parked on the emergency system. If the brake selector was operated to normal system before releasing brakes, fluid below the emergency system lockout cylinders was returned through the normal system.

Two or more of these sequences would deplete the fluid supply, the lockout cylinders would bottom, and the emergency system was lost.

As a correction, a constant bleed was provided to service the emergency lockout cylinders with makeup fluid during operation of the normal brake system. But the correction called for seven additional valves, and numerous

EXTERNAL LEAKAGE BIG DELAY ITEM

Here's how hydraulic troubles affected the flight delay picture of an airline operating eight different transport types in a typical six-month period.

Number of Delays

Source of Trouble	Fleet A	Fleet B	Fleet C	Fleet D	Fleet E	Fleet F	Fleet G	Total	
EXTERNAL LEAKAGE AT—									
Cylinder Piston Rod	2	..	1	..	2	2	..	7	
Valve Shaft	6	..	4	1	..	..	..	11	
Pump Shaft Seal	7	6	3	3	..	..	..	19	
Brake Seal	9	3	5	2	1	1	..	21	
Valve Port Gasket	9	4	1	1	3	8	12	38	
Gear Strut Seal	1	..	..	1	1	..	2	5	
Valve Body Gasket	3	..	..	..	1	3	..	7	
Tubing "B" Nut	7	1	3	1	3	..	..	15	
Flare Failure	..	3	3	1	..	..	..	7	
Hole In Fitting	..	..	..	..	..	..	8	8	
Fitting Replaced	..	2	..	..	1	..	..	3	
Line Replaced	8	3	4	4	..	2	8	29	
Hose Replaced	..	..	3	2	..	..	..	5	
Cracked Reservoir	..	..	1	..	..	..	..	1	
					EXTERNAL LEAKAGE TOTAL			176	68½%
COMPONENT REPLACEMENT									
Valves	10	1	1	2	..	14	4	32	
Pumps	2	1	3	2	1	..	1	10	
Accumulators	12	1	2	1	1	4	..	21	
Brakes	2	3	4	1	1	3	2	16	
Electric Pump	..	..	..	..	..	2	..	2	
					UNIT REPLACEMENT TOTAL			81	31½%
TOTAL NO. OF DELAYS	78	28	38	22	15	39	37		
NO. OF DELAYS PER A/C	2.43	2.33	1.41	2.20	1.36	1.0	3.36		
AVERAGE TOTAL HOURS PER A/C	25,000	21,000	14,300	7,900	26,300	7,200	9,500		

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lines and fittings, all to offset an initial system interconnection deficiency.

Leakage Biggest Problem

• **The biggest single problem** in airline operation of transport hydraulic systems today is external leakage. In a typical six-month survey of experience with a fleet of eight different aircraft types, Hartline found such leakage accounted for 68.5% of flight delays and cancellations due to hydraulics.

Among hydraulic components, major offending leakage areas are valve shaft seals, pump shaft seals, brake seals and valve port gaskets. Other prevalent sources of leaks are flared tube connections and structural failures of tubing, flares and fittings.

Hartline named eight other design difficulties (see box) that contribute to poor performance of hydraulic components.

• **One of the basic explanations** given for tubing and fitting failures is a lack of knowledge of the magnitude and frequency of loads being imposed during system operation.

This is borne out by the fact that failures persist despite use of 400% minimum design margins above maximum working pressures. These margins are obviously more than ample as most design margins throughout the aircraft have proven acceptable if above 150 per cent and the same tubing materials which fail in hydraulics use are structurally sound in other aircraft applications.

Some indication that equipment producers are facing up to the challenge at hand was also evident at the conference.

Hydraulics in Jets

E. I. Brown, Chief Engineer of Vickers' El Segundo Division, told of these developments to further the role of hydraulics in future jets:

• **Alternator Drives**—Current hydraulic-powered alternator drives necessary for constant frequency 400 cycle A-C electrical systems are about twice as efficient as most turbine drives under cruise conditions, Brown pointed out.

Actually, he estimates, efficiency might only be 50 per cent better than variable area turbine drives, but military aircraft designers have not been inclined to use this type due to control difficulties.

Until about two years ago, military jets continued to make increasing use of pneumatic-powered alternator drives. But, says Brown, efficiency advantages of the hydraulic type coupled with deficiencies of the turbine-driven type have changed this trend on practically all military aircraft.

As an added pneumatic system problem, he points out that on such newer jet engines as Pratt & Whitney's J57, compressor bleed air runs as high as 750°F. To cool this air to a useful 450°F would mean large coolers, expansion joints and loss of energy because bleed air temperature is dropped.

• **Supercharger Drives**—Indirect opposition to alternator drive trends, indications are that jet superchargers may change from hydraulic power in present aircraft to turbine drives in jets. For greater efficiency, Brown proposes an existing Vickers 3921 motor pump rated at about 100 hp. Should this not prove as attractive as direct drive arrangements where a high-speed turbine drives a high speed supercharger, Vickers is also investigating potential use of hydraulic turbines for this application.

• **Jet Starters**—Latest in jet hydraulic systems is a combination Vickers MF 3921 motor, overrunning clutch and speed control which has been used successfully in starting J57 engines in several applications. In this installation the MF-3921 produces about 70 hp to bring the engine up to idling speed.

Powerpack to drive the motor, now under development at Vickers, can be made airborne or ground portable. It consists of a 4-cylinder McCulloch gasoline engine, starter, governor and cooling fan, driving a variable displacement hydraulic pump. Complete package will weigh about 150 pounds including pressurized reservoir, filter and engine selector valve.

Other conference discussions disclosed these developments:

• **Monsanto is conducting** an accelerated development program on Viram, a new all-purpose packing elastomer it anticipates will be useable with both Skydrol, mineral oil and virtually all other aircraft fluids.

• **Air Force** in recent years has accumulated sufficient experience with newer cylindrical hydraulic accumulators to go on record that they are definitely less troublesome than spherical types.

• **Hollingshead** has two new hydraulic fluids in final development and approval stages. One, a 200°F-plus successor to Hydrolube, is now undergoing qualification testing at Naval Air Materiel Center and is soon expected to enter the competitive picture. Hollingshead's other fluid, a high-tempera-

Where Past Designs Fell Short

Eight key areas where hydraulic components most frequently demonstrate design shortcomings:

• Failure to combat structural fatigue deficiencies by use of adequate radius relief, rolled threads, short peening and surface finishing. This is classed as the most frequent and most hazardous type of deficiency encountered in hydraulic equipment.

• Failure to design hydraulic components so that they will function with foreign matter that is inherently built into system (pieces of "O" ring, machine filings).

• Failure to consider the effect of component distortion due to pressures within or those introduced by the method used to support the unit in the aircraft.

• Lack of corrosion protection to areas of valves exposed to the atmosphere.

• Failure to use back-up rings for proper retention and protection of "O" rings on dynamic applications.

• Poor selection of materials and surface conditions including hardness and finish.

• Failure to consider the many variables affecting friction, and thereby the functioning of the component and the system.

• Failure to maintain the required quality control during unit production.

Range of Drive Efficiency For Various Loads

(Based on High Altitude Cruise)

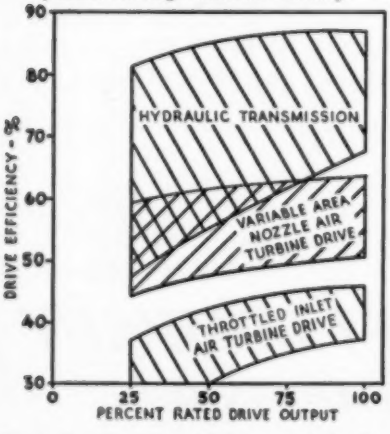

Chart shows greater efficiency of hydraulic transmissions, compared with turbine drives over a wider area of conditions.

ture type, is also nearing the final ap- over 3,000 psi can only show real ad-

Buyer Counts 70,000

Penetrating the "thermal thicket"

Flying at two to three times the speed of sound, airplanes and missiles enter the "thermal thicket," where heat is so intense that rubber and plastics as we know them melt, lubricants boil away, and aluminum grows weak as butter.

New materials and designs, and new testing techniques, are being developed to cope with these and other problems of supersonic flight. If test equipment does not exist, Boeing engineers create their own—as they have in the test device shown above. It raises the temperature of the metal "skin" section 700 degrees or more in a few seconds, to simulate the sudden temperature rise that a fast-climbing missile encounters.

Such tests carry Boeing engineers another step forward through the "thermal thicket." But with each step, new and greater obstacles appear.

Many of Boeing's 6,000 engineers are busy meeting these challenges. They are developing an air conditioning system, adequate for a small hotel, to keep men and equipment cool in the searing temperatures of supersonic flight. They are working with researchers in other industries to produce new heat-resistant materials . . . better insulation . . . electrical systems that won't break down under heat . . . new tires and ways of cooling them where conventional ones would blow out, then melt, then burn.

As a contribution toward aviation progress, Boeing provides laboratory facilities for research and development probably not equalled by those of any private concern in the world. But even more important are the men themselves. Their skill, imagination and devoted research will bring you even more powerful weapons of defense, and faster, safer, more comfortable transportation in the epoch of supersonic flight just ahead.

BOEING

ture type, is also nearing the final approval stages.

• **Union Carbide and Carbon** reports that the Navy is procuring limited quantities of its Hydralube AC water-based hydraulic fluid under revised Spec MIL-H-7083A. New requirements call for more stringent corrosion limitations and high temperature stability.

Contrary to general thinking that higher pressure hydraulic systems mean lighter weight is Vickers Armstrongs experience in V.1000 studies. Examination showed that a 4,000 psi system for landing gear retraction would have been heavier than the lower pressure 3,000 psi design. Consensus was that systems over 3,000 psi can only show real advantage when space limitations dictate their use.

Both the Lockheed Electra and Douglas DC-8 will have hydraulic control boost systems, probably of the independent "package" type. Electra had aerodynamic boost when bordered by American Airlines but recent increases in gross weight and dimensions necessitated the change. Boeing's 707 is without hydraulic control boost.

The Electra will still have one of the simplest hydraulic systems yet devised. A main and standby system will each be powered by two of four engine-driven variable displacement pumps.

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Ryan Counts 70,000 Spotwelds on KC-135

Ryan Aeronautical Co. estimates the number of spotwelds required for the mid-fuselage section it fabricates for the Boeing KC-135 jet tanker-transport at 70,000. It also believes this is the first time in the aircraft industry's history that skins of such large proportions have ever been spotwelded on a production basis.

The great number of spotwelds required for the splicing of skins and for the attachment of doublers and of stiffeners to skins pointed up difficult problems in maintaining the skins' contours while accurately positioning the skins to the spotweld machine.

For the single-contour skins, which are flat and wrapped on the fuselage assembly, Ryan devised a spotweld positioning table, 22 feet long, with "wall-to-wall" carpeting. This is an indexing table on which the panel is moved beneath the electrode in an accurate position.

For the double-contour skins, an overhead handling rig, consisting of crane ways and permitting four-directional movement, was built. Three hoist units are mounted on the crane ways, and are attached to the welding fixture frames in which the skins are mounted. Leveling is accomplished by electronic control units connected to the hoist.

So large is the handling apparatus for both single and double contour skins that it overshadows each spotweld machine itself.

Contracts

• **Easton Manufacturing Co.,** Battle Creek, Mich., has been awarded a $4,640,000 Air Force contract to manufacture facilities for the production of titanium compressor blades for Pratt & Whitney J57 and J75 engines.

• **Curtiss-Wright Corp.,** Electronics Division, Carlstadt, N. J., has received a $500,000 contract for B-52D flight simulators, spare parts, tools and ground-handling equipment.

• **Boeing Airplane Co.,** Wichita, has been awarded a $742,316 contract for maintenance of aircraft for the B-47 production program.

• **Thompson Products, Inc.,** Cleveland, has a $300,000 contract to produce facilities for shipment and a $1,427,750 contract for purchase and installation of facilities.

• **Hughes Tool Co.,** Aircraft Division, Culver City, Calif., has a $415,000 contract for production facilities for the prototype MA-1 interceptor and weapons control systems.

Twin Coach Aircraft Division is a subcontractor for Boeing, Cessna, Grumman, Martin, North American, Republic

Twin Coach helps Boeing get them in the air

Sooner

The Boeing KC-135 jet tanker-transport is of vital importance to the national defense. The prototype of this airplane—America's first jet transport—is shown above. To produce and deliver KC-135s to the Air Force as rapidly as possible, Boeing enlisted the aid of Twin Coach Aircraft Division as a subcontractor for major airframe assemblies.

This important assignment typifies the way prime contractors rely on Twin Coach Aircraft Division. For Twin is staffed with experienced aircraft specialists to design and build tooling . . . with experienced aircraft production personnel . . . under experienced aircraft supervision and management.

If you have an assembly you're thinking of subcontracting, call Twin Coach Aircraft Division. You'll be secure in the knowledge that your assembly will be built by *aircraft* specialists—by men whose sole aim is to build to specification . . . on schedule . . . at the lowest possible cost.

AA-1401

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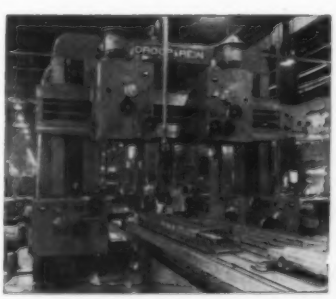

Giant 25-foot Droop & Rein universal planer mill, only one of its kind in the country, was recently installed at Twin Coach Aircraft Division.

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Fokker Makes Comeback Bid With F-27

Twin-engined Dutch 'DC-3 replacement' to carry 40/44 passengers and be powered by Rolls-Royce Dart engines.

By JAMES HAY STEVENS

AMSTERDAM — Fokker's commercial comeback with the F-27 Friendship "DC-3 replacement" promises to be an event of considerable importance. Alone among those entering this field, the Dutch company has concentrated upon making a completely modern airplane entirely within the DC-3 payload/range/airfield envelope. This must have required considerable courage when the initial market research was being carried out—since the airline tendency is always, like Oliver Twist, to ask for something more.

The Dutch, however, decided that the best sales chance lay in offering an airplane that could be operated economically on routes where the standard regional airliners could not achieve break-even payloads. To stretch the payload from 24/36 to 40/44 passengers immediately brings the airplane to the fringe of the Convair/Viscount market.

• **With the size settled,** the number of engines was the next key decision to be made. The International Civil Aviation Organization's engine-out requirements penalize the twin in a way that was never even thought of by the designer of the DC-3. Here Fokker made the bold decision to stand by two engines of the most modern and airline-proven type that would be available in 1957, the Rolls-Royce Dart.

In effect, Fokker hopes to hitch the Friendship to the Viscount/Dart bandwagon—and reckons that Vickers' satisfied customers will be its prime sales potential.

With this decision made, the problem resolved itself into the aerodynamic and structural refinements needed to get the airplane in and out of a 3,800-feet airfield with full I.C.A.O. safety provisions—and a *paying* payload.

Chief engineer, Ir. H. C. van Meerten explained to this writer that "aerodynamic efficiency pays off—two m.p.h. on the cruising speed is a lot of fuel and payload in the life of an airplane.

The new Fokker "double-slotted compound flaps" had been evolved to do two jobs required by I.C.A.O. airfield provisions: to give climb-away lift and a high ^{C}L for low drag on the approach to meet the balked landing case. Over-the-fence drooping of the rear flap component gives maximum drag for deceleration on touchdown.

Metal-to-Metal Bonding

The all-out use of Redux metal-to-metal bonding, said van Meerten, was adopted to insure a fatigue-free structure. As a "neutral" the Netherlands could adopt the best of both worlds and the Friendship incorporated U.K. experience of bonding and U.S. knowledge of fiberglass technique.

Biggest headache had been the severe new CAA anti-icing requirements, which have caused the abandonment of the original plan for fiberglass leading edges on wing and tail.

• **Aerodynamic efficiency** has been achieved by careful attention to detail in streamlining and concentration on a high standard of surface finish. The small airplane suffers a relatively high frontal area because there is a practical minimum seating width. In the Friendship this is taken as 100.4 inches internal diameter, giving an external cabin radius of 53 inches. Some frontal area (and structure weight) is saved by using a larger underfloor radius to flatten off the bottom and yet maintain a good pressure form. A false roof accentuates the oval cross-section, fairs the fuselage cleanly to the wing and provides an unpressurized control-run duct.

Blending of fuselage tail cone, control duct, dorsal and main fins is a complicated piece of art. Despite the several curves and planes involved, structural simplicity has been maintained while meeting the airflow pattern revealed by extensive tunnel tests. Underslung engine nacelles, likewise, combine ample gear and accessory stowage space with good aerodynamic form. The curved top line and long tail insures clean flow at high incidence and with flaps lowered.

(*Continued on Page 59*)

Fokker Friendship is latest foreign entry in twin-engined transport field.

Aeroquip

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NEWS

IN TEFLON HOSE!

See Next 3 Pages

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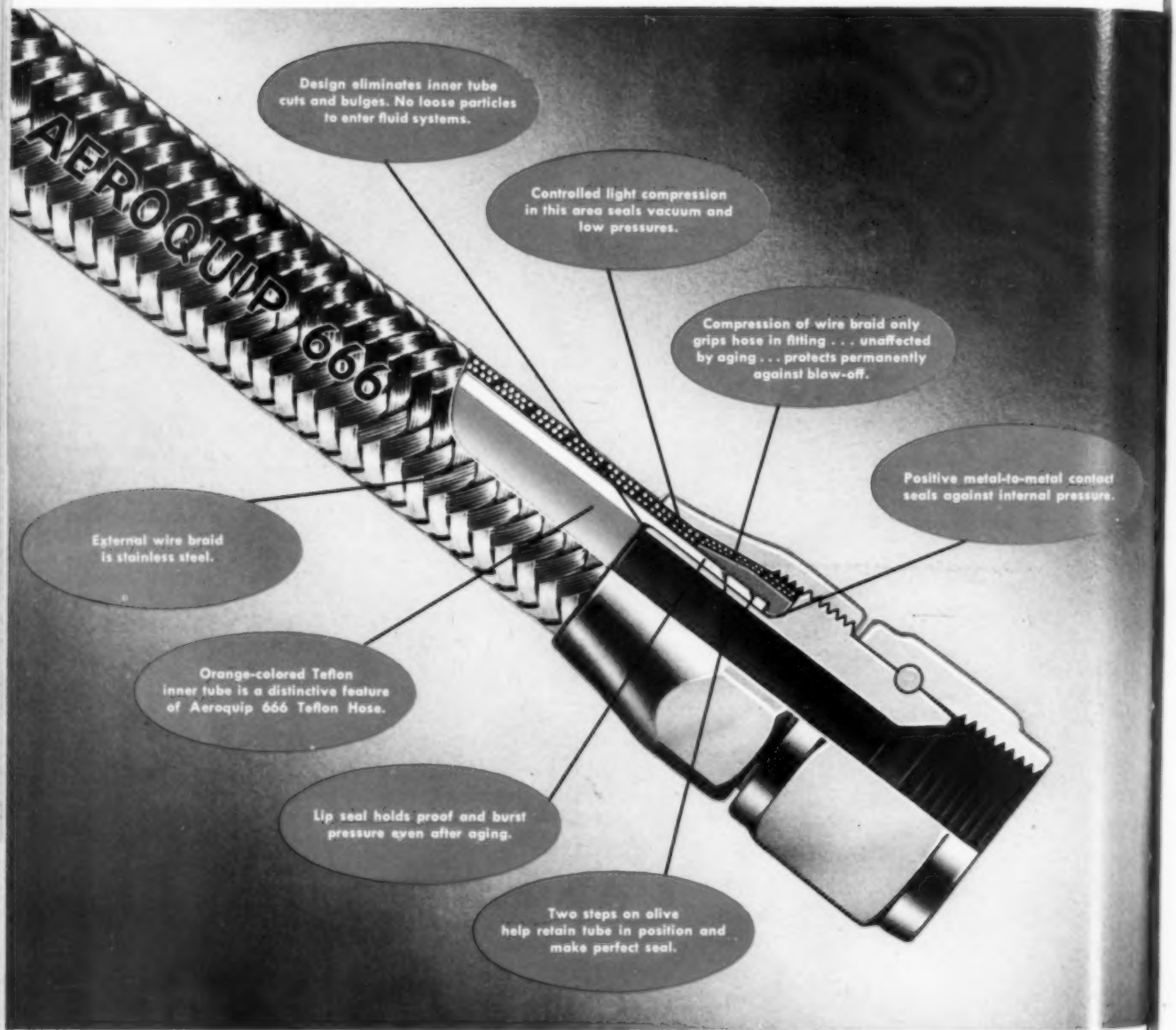
AEROQUIP 666
Design eliminates inner tube cuts and bulges. No loose particles to enter fluid systems.
Controlled light compression in this area seals vacuum and low pressures.
Compression of wire braid only grips hose in fitting . . . unaffected by aging . . . protects permanently against blow-off.
Positive metal-to-metal contact seals against internal pressure.
External wire braid is stainless steel.
Orange-colored Teflon inner tube is a distinctive feature of Aeroquip 666 Teflon Hose.
Lip seal holds proof and burst pressure even after aging.
Two steps on olive help retain tube in position and make perfect seal.

"*super gem*" is an Aeroquip trademark

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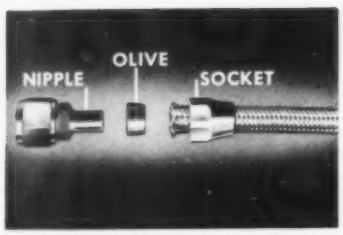
Leakproof "*super gem*" Fittings

(PATENT APPLIED FOR)

and 666 Teflon* Hose

ASSEMBLE QUICKLY, EASILY WITH ORDINARY BENCH TOOLS!



Aeroquip's new "*super gem*" Fitting consists of nipple, olive, and socket. First step in assembly is to slide socket over the hose.

Next, the olive is pushed by hand into position between the Teflon inner tube and the wire braid.

Assembly is completed by screwing the nipple into the socket using an ordinary AN adapter.

"*super gem*" FITTINGS WILL NOT LEAK EVEN AFTER HIGH TEMPERATURE AGING. Unlike conventional swaged or crimped fittings, the "*super gem*" Fitting does not hold the hose by compression of the Teflon inner tube. There can be no loss of compression due to the cold flow characteristics of Teflon with resultant leakage at proof pressures.

"*super gem*" FITTINGS SAVE WEIGHT. Available in steel, stainless steel, or aluminum, "*super gem*" Fittings offer significant weight savings . . . particularly in the larger sizes.

ELIMINATE EXPENSIVE, HEAVY ASSEMBLY OR SWAGING MACHINES. A vise and a wrench are the only tools needed to assemble 666 hose and "*super gem*" Fittings.

SIMPLIFY ENGINEERING MOCK-UPS AND PRODUCTION CHANGES. Development and production engineers have complete freedom in making changes, even on the production line. New hose lines can be made in minutes. Scrap costs are kept to a minimum because end fittings on assemblies can be reused and hose salvaged.

REPLACE HOSE LINES QUICKLY IN THE FIELD. Simple assembly of 666 hose and "*super gem*" Fittings makes field replacement easy. Minimum inventories of bulk hose and fittings are required for field storage.

666 TEFLON HOSE IS DESIGNED TO AEROQUIP'S EXACTING SPECIFICATIONS. Distinctive orange-colored inner tube provides positive identification. Operating temperatures are —100° F. to +500° F. Sizes and pressure ranges are suited to all engine and airframe fluid systems.

*Du Pont Trademark for its tetrafluoroethelene resin

Aeroquip Bulletin AEB-9 Gives Complete Technical Information and Test Data

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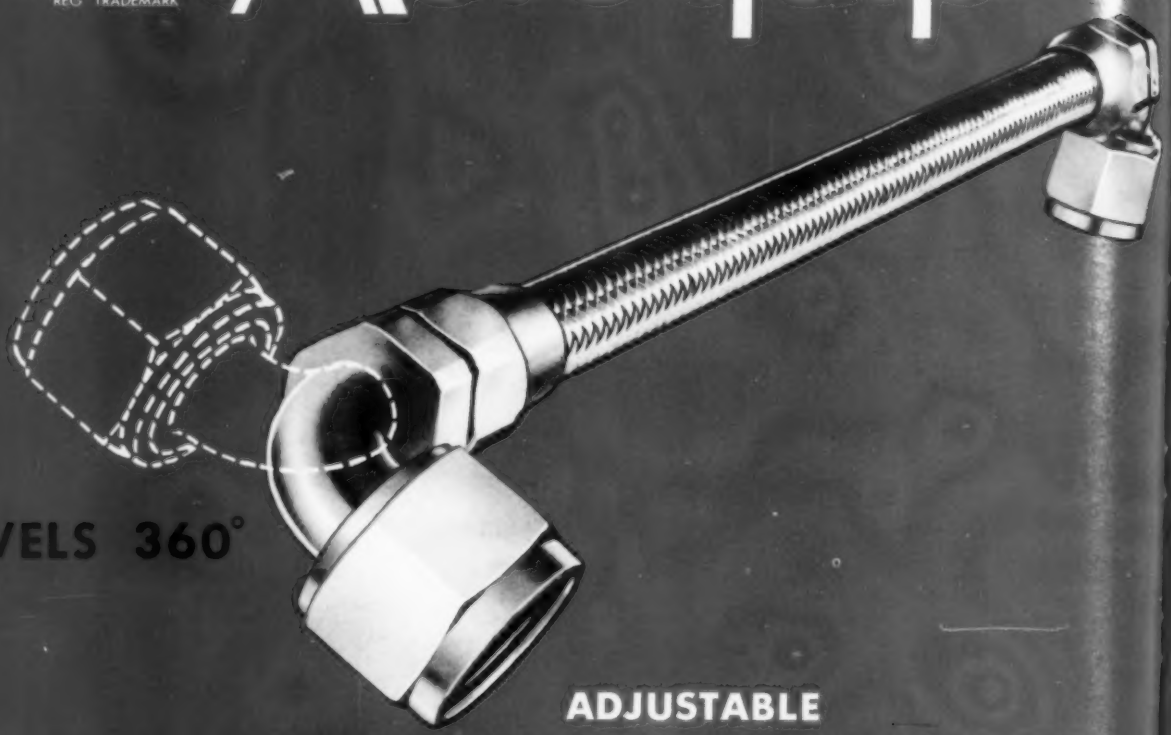

SWIVELS 360°

ADJUSTABLE ELBOW FITTINGS Simplify Hose Line Installation

Aeroquip *"super gem"* Adjustable Elbow Fittings can be loosened and rotated to the exact position required as the hose assembly is installed. They are then tightened in position. This adjustment has absolutely no effect on the grip of the fitting on the hose. There is no danger of hose twist. Ordering is simplified.

Aeroquip Corporation,
Jackson, Michigan

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Get complete technical information and test data on Aeroquip 666 Hose and *"super gem"* Fittings!

(*Continued from page 54*)

• **High-wing layout** was chosen for several reasons: it provides the ground clearance deemed essential with the special flaps; it gives tip-to-tip lifting surface with minimum fuselage interference; propeller clearance is automatically ample; wingtip clearance is good for obstructions in outback areas and for forced landings.

Since a 53-inch fuselage radius is insufficient for adequate underfloor stowage, the low-wing simply creates waste space in a small-size transport. Not least, of course, passenger reaction, as proven by British European Airways' Elizabethan experience, is strongly in favor of the high wing.

To combine good take-off characteristics with low cruising drag a high aspect-ratio, low taper-ratio wing (12 and 0.4 respectively) were chosen, using the high-efficiency National Advisory Committee for Aeronautics 64,421 profile. This is a thick airfoil, 21%, but is of laminar-flow type so that the gain in take-off ^{C}L is not offset by high drag —at least not at the Friendship's designed 266-280 mph. cruising envelope.

Massive, Single-Fin Tail

• **The massive tail,** and it really looks big, is the only way of meeting modern stability and control requirements with a failed engine under the balked landing and climb-away power cases. Fokker decided that a tall single fin with a long dorsal lead-in would be lighter and structurally more reliable than end-plates.

Brochure data give the stabilizer span as 32 ft. 2 in. (one third of the wing span) and area 172 sq. ft., with 129 sq. ft. vertical area—this last figure seems to omit the side areas due to stabilizer dihedral and the deepened rear fuselage.

• **The double-slotted compound flaps** have been designed from extensive two-dimensional tunnel tests. Curves show how the lift/drag values are expected to develop in full-scale. The flaps extend for over half the span and the two elements have a total chord 31% that of the wing. The flaps operate like Fowlers, extending back and down to 40°, after which the rear section goes on down another 40°—the rear face is actually vertical to the chord line.

Anticipated technique will be to use 25° for take-off, giving a ^{C}L of 2.3 for a ^{C}D of 2.0. On the approach 35° of flap is the likely setting, giving a ^{C}L of 2.55, then over the hedge they will be drooped 40/40 to cushion down on a ^{C}L of 2.95 with a drag coefficient of 4.0.

Although the last flap movement is primarily to obtain braking drag, the double slot prevents an airflow breakdown so that the lift coefficient rises to compensate for the sudden deceleration.

These flaps will be very heavily loaded, particularly the rear drag section, and the mechanism required considerable engineering research. Structural tests have included 30,000 deflections over the full travel under maximum load.

• **Rolls-Royce Dart 511** for production Friendships has a special reduction-gear ratio of 0.086. To go with this is a special 12-ft.-diameter Rotol propeller. The combination insures maximum take-off thrust. Third oil-line supply to the take-off pitch angle stop gives reliable feathering and unfeathering under cold oil conditions.

Single-lever engine/propeller control and auto-pitch coarsening with a fall in engine torque are fitted. Accessories are grouped on Rotol accessory gearboxes mounted in the top of the nacelles.

Structural Design

The Friendship structural design is based fundamentally upon achieving maximum fatigue life. The production research department, under R. J. Schliekelmann, has made this a major task for the past seven years—this program was inaugurated even before postwar airliners ran into trouble with 75 S-T and the fatigue problem reached its hideous climax in the Comet.

Design application of Redux has been two-fold: to replace rivets and to avoid stress concentrations. In the first place, all skin stiffeners are bonded where panels are flat or curved in one plane on the prototype, but in production the use of Redux will be extended. Skin thickness is varied by using laminations around cut-outs and in heavily-loaded areas.

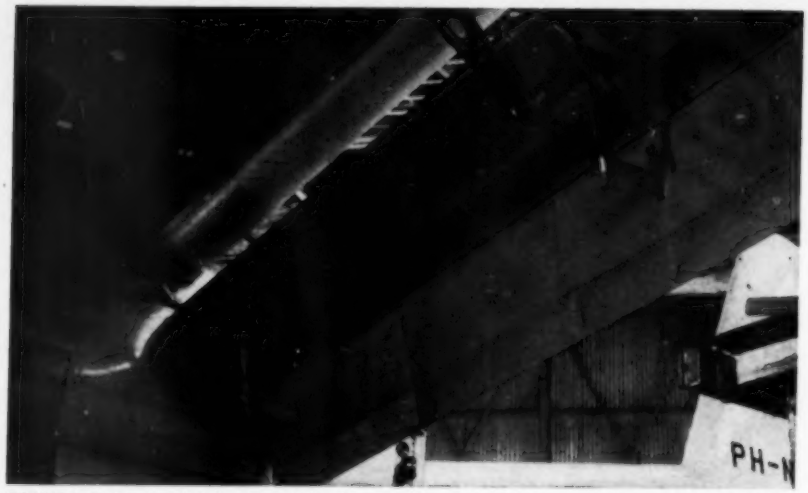
The wing design is based on a torsion box with a heavily-stiffened top skin able to take compression loads and so the webs and booms are light. The webs are plain sheet with vertical Reduxed shear stiffeners and laminated T- and L-section booms. The characteristic form of the machined extrusion is achieved simply by superimposed laminations. This method uses the whole strength of the sheet metal and there are no awkward machining stresses, distortions or uneven cross-sectional strength.

Fiberglass has been used very widely for intersection fairings, flap and aileron shrouds, wingtips, fuselage nose and surface leading edges. The method is to use external surface form molds and to lay the glass fabric on and brush in the polyester resin by hand. Setting is mostly at room temperature, sometimes accelerated by infra-red lamps.

Fokker tests have proved fatigue resistance superior to metal, good form

Fokker Friendship Data

Dimensions	
Span	95 ft. 0 in.
Length	73 ft. 0 in.
Height	27 ft. 6 in.
Tail plane span	32 ft. 2 in.
Track	23 ft. 8 in.
Wing area	754 sq. ft.
Aspect ratio	12
Weights	
(Dependent upon seating layout)	
Empty	20,610-20,950 lbs.
Operating (crew and services)	21,325-21,685 lbs.
Max. payload	9,175- 9,535 lbs.
Max. take-off	34,200 lbs.
Max. landing	32,630 lbs.
Engines	
Prototype: Rolls-Royce Dart 507	
Take-off power	1,540 shp
Production: Rolls-Royce Dart 511	
Reduction gear ratio	0.086
Take-off power, sea level	1,600 shp + 375 lbs. t.
Climb power	1,460 shp + 340 lbs. t.
Performance Summary	
Max. cruising speed	280 mph at 20,000 ft.
Economical cruising speed	275 mph at 20,000 ft.
Rate of climb, sea level	1,640 ft./min.
Service ceiling	35,000 ft.
Single-engined operating height	14,000 ft.
Stage length	up to 1,000 miles
Take-off run	4,200 ft.
I.C.A.O. take-off and landing allowance	3,750 ft.



FOKKER F-27's good take-off and landing performance mainly stems from big flaps. Outer section of flaps is shown here fully lowered. Note flap rail in nacelle, and linkage for rear flap "drooping." Flap shroud is of fiberglass except for slipstream portion, which is metal-reinforced.

preservation under load and low weight. Despite high material costs the saving in fabrication time on fiberglass parts makes them cheaper than metal ones, say Schliekelmann.

Although the main gear looks long, this is not due so much to the high wing as to propeller clearance. Units are Dowty, with a liquid-spring for the stubby lever-action nose unit.

Retraction and nosewheel are pneumatic from a Dunlop system, chosen because it avoids fluid leaks and fire risk. Dunlop wheels and tires with Maxaret brakes are standard.

• **Cabin design** includes elliptical windows which give even stress distribution under pressurization. Alternate stress paths are provided. Perspex panels are inset in fiberglass-laminated frames which alone are drilled, so that there is no crack source in the glazing.

The cabin is beefed-up under the wing and the underfloor structure incorporates two longitudinal beams to act as belly-landing skids. The 9g seats are attached to rails on these beams and close to the fuselage sides.

The flooring is a Fokker sandwich of 24 S-T with a metal honeycomb bonded by the new Redux film. A test panel, complete with carpet, has been used as a mat at the foot of the Fokker main office stairs for the past two years.

Fokker is building three further prototype airframes, one for fatigue tank testing, one for static loading, and one fully equipped with production Dart 511 engines, 12-ft. propellers and deicing for service trials. Production is slated to start in mid-1957 and can be at the rate of one airplane per week. KLM has placed an initial order.

◈ ◈ ◈

Aircraft Builders Set New Standards For Machine Tools to Speed Production

The production rate of certain airframe parts may be speeded up as much as eight to 10 times through the introduction of new standardized milling machines for aircraft industry plants.

Under a program sponsored by the Aircraft Industries Association, aircraft manufacturers for the first time will fashion parts with tools designed and standardized industry-wide for aircraft production. By contrast, most of the machine tools in use today in the aircraft industry originally were designed for production in other industries.

AIA says the new units not only will greatly increase the flow of vital parts for highspeed aircraft, but also will:

• Increase peacetime efficiency.

• Provide greatly expanded mobilization capacity.

• Reduce lead time greatly on certain integral parts.

• Provide for interchangeable tooling, permitting the same parts to be produced on different machines.

• Broaden the production base by making standard machine specifications applicable to all aircraft plants.

• Reduce manpower, although in some cases generating a need for more skilled workers.

• Reduce the cost of aircraft.

• Reduce handling time of parts being worked.

• Cut floor space needed and number of machines required.

• Make stockpiling of machine tools more feasible.

• Make possible the machining of newer metals at greater speeds.

• **Specifications** for the new machines have evolved from two years' study by representatives of the aircraft industry, the tool industry and government officials.

The program, initiated by the Manufacturing Methods Committee of the AIA, is both long and short-range. Part of it will put some standardized tools into immediate production, but since the overall program involves retooling, the complete schedule of changeover will require several years.

First production of prototype milling machines to be built under the new specifications will be purchased by the Air Force under the Department of Defense's machine tool mobilization stockpiling program.

• **In some cases,** present machines may be adapted to meet specifications called for by use of new metals and demands of the mobilization program. In most cases however, entirely new machines must be designed and built and new structures constructed.

Industry spokesmen say standardization of aircraft machine tools will eliminate many production bottlenecks that have occurred in the past. One company building its own airplanes, for instance, used tools that did not fit the standards used by another manufacturer. With the new tools, it will be possible for a manufacturer to enter the production schedule of almost any other aircraft builder by interchanging the tooling components of the big milling machines.

• **Individual tool makers** will not lose their identity under the standardization program, it is pointed but, since they will still retain original design techniques. The end product of each machine will, however, be the same.

AIA pointed out that it was the vast production made possible by America's machine tools that brought on the collapse of both Germany and Japan in World War II. Both nations discovered too late that machinery and equipment were the limiting factors in production.

AA Seeks 250 Mechanics

American Airlines is seeking 250 mechanics for its Tulsa maintenance base, where the company is making modifications in its DC-7s, boosting their range and gross weight and equipping them with airborne weather radar. Present employment at Tulsa exceeds 3,000.

AA is also planning to begin remodeling interiors of its DC-6s.

Jet Engine Blades with Superior Fatigue Strength are Produced by the Eaton ROLL-FORM Process

EATON® ROLL-FORM

The Eaton ROLL-FORM Process, originated and developed by the Eaton Manufacturing Company, has produced millions of jet blades by a simple rolling operation. The grain structure of the metal is rolled to conform to the blade contour, thereby producing a blade with superior fatigue strength characteristics.

In addition, the ROLL-FORM Process produces blades with a minimum of forging and machining scrap. This means worthwhile economies in the costly alloys which represent an ever larger proportion of the raw materials being used in jet engine blade production.

EATON MANUFACTURING COMPANY
AIRCRAFT DIVISION
BATTLE CREEK, MICHIGAN

Circle No. 28 on Reader Service Card.

New Products and Processes

PORTABLE TEST MACHINE

Greer Hydraulics, Inc. has developed a portable test machine, Model FF, for testing the performance and operation of hydraulic systems of components of aircraft and other equipment.

The design enables these mobile machines to be used aboard aircraft carriers, in aircraft shops and in other industrial applications in which a low-slung, maneuverable machine is needed. They are suitable for testing the landing gear or control surfaces of aircraft, or a system to actuate a ram on a machine tool. They drain and filter hydraulic fluid and refill the hydraulic system.

FF machines come with 10- and 20-gal. capacities.

Circle No. 153 on Reader Service Card.

MINIATURE MOTOR

General Electric has developed what it believes to be the smallest motor now used in aircraft. It weighs only 1.2 oz. yet is said to be rugged enough to withstand the punishment of high-altitude flying in temperatures down to 67 below zero.

The tiny motor, developed for a variety of aircraft uses, was designed for a top speed of 19,250 rpm. It now powers a braking mechanism in G-E's aircraft gyro compass system.

Precise measurements were not announced, but the motor is slightly more than an inch long and five eighths of an inch in diameter. Company engineers predict other uses for it such as a power source for control systems.

Circle No. 163 on Reader Service Card.

RATE GYROSCOPE

Gyromechanisms, Inc. has developed a new line of ruggedized, highly precise rate gyroscopes. Maximum size is 2½ in. in diameter, 4½ in. in length, maximum weight 2 lbs. Dc, ac-hysteresis and governed-induction motors are available.

Performance is based on normal 100% flotation in silicone fluid, a choice of dampening systems, gyro angular momentum up to 10^6 gm. cm^2/ sec. and an unusually high inertia ratio, making possible high undampened natural frequencies.

Circle No. 164 on Reader Service Card.

TEST STAND

Auto Control Laboratories has developed a new test stand for testing hydraulic equipment and accessories.

Designated Model 2632, the stand gives performance data for most hydraulic system components and accessories, including valves, regulators, cylinders, actuators, etc. By means of a pressure control relief valve, equipment may be tested at pressures ranging from 500 psi to 5,000 psi.

The stand weighs 1,500 lbs. It may be connected to a 220/440-volt 60-cycle 3-phase line and to water supply and drain.

Circle No. 150 on Reader Service Card.

HEET-O-MAT

Heet-O-Mat is a weatherproof, waterproof, electrically heated rubber sponge mat, one-quarter inch thick, designed to add to the comfort of mechanics and others working in hangars and repair shops affected by cold and dampness. It is supplied by the **Radiant Heat Sales Co., Inc.**

Heet-O-Mat uses only 80 watts of current and is said to cost less than a cent an eight-hour day to operate. It covers an area 24x13 in. wide, provides a warm, dry and comfortable place on which to stand.

Circle No. 154 on Reader Service Card.

SELF-LOCKING NUT

A one-piece, all-metal self-locking nut made by the **Shur-Lok Corp.** is said to provide safe, sure locking at temperatures as high as 1,200° F.

The Shur-Lok nut is offered in low-carbon, medium carbon and stainless steels. The self-locking feature is provided by a narrow collar that makes use of the elasticity of the metal itself.

Shur-Lok nuts are offered in standard sizes of 4/40 to 1½ ins. with larger sizes available on special order.

Circle No. 165 on Reader Service Card.

BATTERY CHARGER

Majors Aircraft Engineering Co. is producing a bench-size battery charger, now in use at Northrop Aircraft, Inc., that is said to extend the life of flashlight batteries by as much as 400%.

Before the charger was installed Northrop used and discarded approxi-

Circle No. 29 on Reader Service Card.

mately 13,000 flashlight cells per month. By prolonging the average life of a batery four times its normal span, a large saving is effected.

The charger takes 192 batteries when fully loaded. The charging operation requires two hours. Cost of the charger was said to have been offset in 45 days after it was installed by the value of the batteries salvaged during that period.

Circle No. 166 on Reader Service Card.

FABRIC BURST TESTER

Newly designed burst test quipment has been announced by **Pacific Airmotive Corp.** Designated Model TE-5761, the unit was developed for testing the burst strength of fabric and textiles, paper and paper products, and plastic in sheet form, up to 600 psi.

Featured is a completely hydraulic system energized by a ¼-hp, 110/125-volt, single phase, 60-cycle electric motor. The burst indicating gauge records the maximum burst pressure required and also establishes a residual pressure reading to allow determination of the true burst value of the test sample.

The unit weighs 87 lbs., measures 18 x 21 x 14½ in.

Circle No. 151 on Reader Service Card.

'WAFER CELL' BATTERY

Development of what is termed a "revolutionary new wafer cell" that is said to extend the life of dry batteries by as much as 30% and at the same time increase production levels sharply has been announced by the **Burgess Battery Co.**

The development of the cell is regarded by the company as a major step toward automation in the manufacture of dry batteries. The cell consists of a "sandwich" of artificial manganese dioxide mix between tiny discs of flat zinc and carbon electrodes.

The carbon rod formerly used in round cell batteries has been supplanted by a small piece of conductive carbon

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Circle No. 30 on Reader Service Card.

Hy Trol and the Rejected Take-off

Mercifully, says Hy Trol, this is a decision that most men are rarely required to make. But it is a possibility that must be faced, especially by the airplane pilot. If take-off has to be rejected, he faces a mighty big problem: *the ability to stop!*

Under such unusual conditions it is best to have Hy Trol's tried and trusted method at your fingertips, for Hy Trol reduces stopping distance by more than 33%

If your operating efficiency, your reputation and your investment in aircraft are not already protected by Hy Trol, contact Hydro-Aire now.

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BURBANK, CALIFORNIA • *Aviation Subsidiary of* CRANE CO.

Circle No. 31 on Reader Service Card.

NEW PRODUCTS

and the whole sandwich is machine-wrapped in an airtight pliofilm envelope and heat-sealed.

The cell is smaller than the average person's fingertip, yet it develops so much power that a tiny 2-in. battery of 13 cells develops 22½ volts of power.

Circle No. 167 on Reader Service Card.

CONSTANT VOLTAGE SOURCE

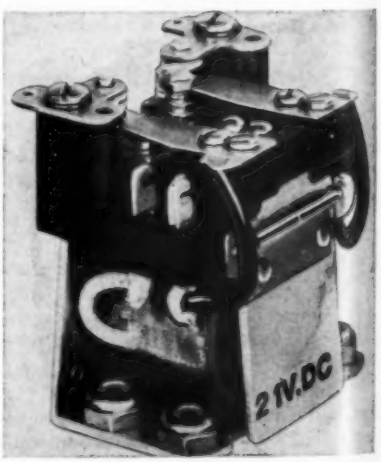
A voltage source that provides constant dc output through ambient temperatures as low as —55°C up to 100°C is being produced by **Avien, Inc.**

Called the "k-Volt Standard," the unit is designed to replace the chemical cell and VR tube as an absolute reference, constant output working supply or voltage regulator in airborne, laboratory and other instrumentation requiring extreme stability in varying environmental and operating conditions.

A number of models are available for various applications. Operation may be from either an ac or dc source.

Circle No. 152 on Reader Service Card.

RELAY



Ohmite Mfg. Co. offers the Ohmite Amrecon Model DOS relay, specially designed to meet the rigorous standards for aircraft relays.

A general purpose relay with a wide range of applications, the unit has

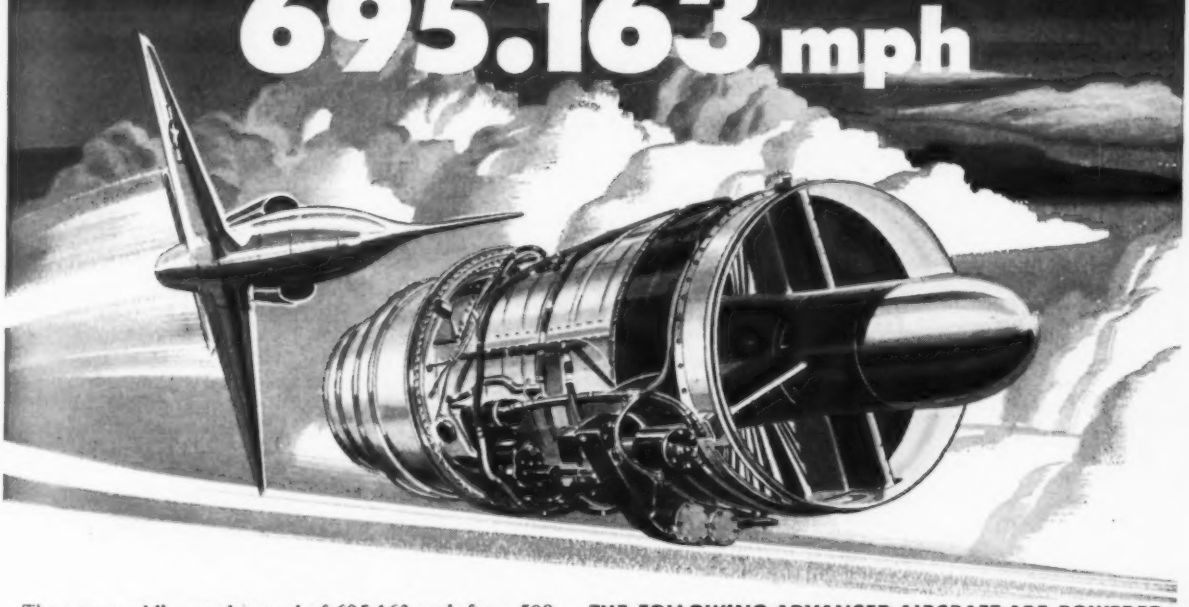
U.S. NAVY

Douglas A4D "Skyhawk" powered by Curtiss-Wright

J65 JET

sets new World's Record for 500 km Closed Course

695.163 mph



The new world's speed record of 695.163 mph for a 500 kilometer (310.6 mile) closed course – just established by the U.S. Navy Douglas A4D "Skyhawk" – is the latest in a list of record performances by aircraft powered by the Curtiss-Wright J65 Jet Engine. The new world mark, topping the previous record by 45 mph, was set in 5 laps around a 62.1-mile course at altitudes under 328 feet – a rugged test for aircraft and pilot, as well as for dependability and power of the Curtiss-Wright J65 Jet. That this nearsonic U.S. Navy record was set on a closed course of small diameter is indicative of the greater straightaway speed and phenomenal maneuverability of the compact, powerful "Skyhawk."

A U.S. Navy Carrier-based attack bomber less than half the size of many current operational jets, the A4D can carry the atom bomb, rockets, machine guns, and missiles over greater distances – faster.

Other speed records held by Curtiss-Wright J65 Jet-powered aircraft include the Bendix Trophy mark of 616 mph – fastest Bendix time ever made; the Los Angeles-New York non-stop record, 649 mph; the distance-time-mass flight record non-stop England to Austin, Texas – all the foregoing set by J65-powered U.S. Air Force Republic F-84F "Thunderstreaks."

Most important, the J65 has power in reserve for the demands of tomorrow – making it the outstanding military powerplant of its type.

THE FOLLOWING ADVANCED AIRCRAFT ARE POWERED BY THE CURTISS-WRIGHT J65 JET:

DOUGLAS A4D "Skyhawk" carrier-based attack bomber for the U.S. Navy

LOCKHEED F-104 high-performance fighter for the U.S. Air Force

NORTH AMERICAN FJ-4 advanced shipboard fighter for the U.S. Navy

NORTH AMERICAN FJ-3 "Fury" carrier-based fighter for the U.S. Navy

MARTIN B-57 light bomber for the U.S. Air Force

REPUBLIC RF-84F "Thunderflash" photo reconnaissance fighter for the U.S. Air Force

REPUBLIC F-84F "Thunderstreak" fighter bomber for the U.S. Air Force

(plus other high-performance military aircraft of classified status)

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CONVAIR
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POMONA, CALIFORNIA

NEW PRODUCTS

a contact rating of 15 amperes at 115 volts ac or 32 volts dc, noninductive load. It is available in a wide range of coil operating voltages.

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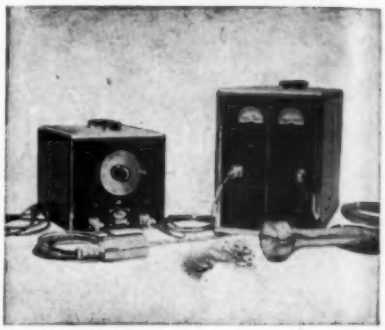
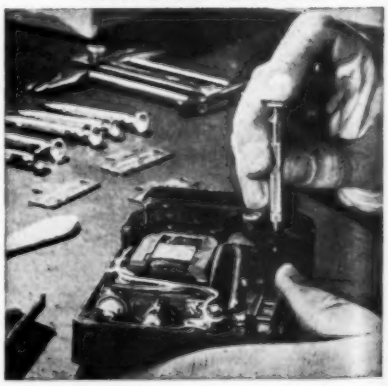
VIBRATION TEST FILTER



The International Research and Development Corp. is producing a Model 1064 continuously variable filter for use with the vibration analyzers they manufacture. Use of the filter permits observation, recording and direct reading of all vibration frequencies in a mechanism under study by tuning the filter or scanning the spectrum with it. Tuning range is 500 to 50,000 cpm. Another Model, 1065, extends the range to 500,000 cpm. The filter is rated to have a flatness response of 3%.

Circle No. 158 on Reader Service Card.

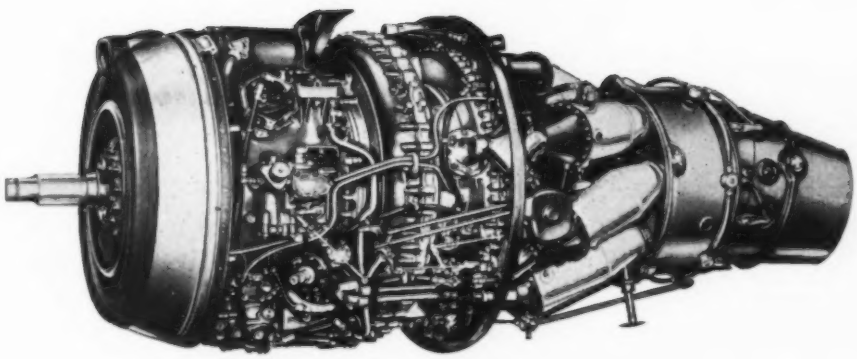
HIGH-SPEED CAMERA



A camera that keeps an eye on guided missiles in flight and can be carried either in a missile or aboard a chase plane has been introduced by **Gordon Enterprises.**

Designated Model 55 GE, the camera is little larger than a man's hand and can photograph as many as 200 pictures per second. Its purpose is to obtain a photographic record of the flight path and performance of a missile in the air, recording missile instrumentation as well as terrain and sky or horizon, all in the same strip of film.

(*Continued on page* 70)



The ROLLS-ROYCE DART

propeller turbine aero engine

has been chosen for the FOKKER FRIENDSHIP. This gas turbine powers the VICKERS VISCOUNT — the first propeller turbine engined airliner in service in the World which has already been ordered by twenty-two airlines

ROLLS-ROYCE LIMITED · DERBY · ENGLAND

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PARTNERS IN PROGRESS . . .

BRANIFF

AND **TWA**

Hats off to Braniff Airways, TWA interline partner providing TWA passengers with swift, comfortable North-South service throughout the Middle West and Latin America!

When you're in the Middle West, there's no question about it — you fly Braniff Airways' swift, luxurious DC-6's between key cities North and South. And if you're planning a trip to South America, Braniff is your wise choice, too.

For ever since TWA and Braniff have been interline partners, TWA passengers have enjoyed wonderful service via Braniff connections at St. Louis, Chicago, Kansas City and Amarillo — and the exclusive TWA-Braniff through-plane service between Houston and Las Vegas, Los Angeles and San Francisco.

As TWA celebrates it's 30th year of service, it hails Braniff's outstanding service to the flying public and the high standards it has set in the airline industry.

Fly the finest . . . **FLY TWA**

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How to open a Watchmaker's Eyes...

Many people regard a 21-jewel watch as the ultimate in precision. Yet, a modern airplane engine is built to a standard of precision far beyond that of the finest watch. For the engine, with moving parts machined to the Nth degree, must operate at speeds in the thousands of revolutions per minute, at temperatures that would melt many metals. And they must do it hour after hour under full load.

Such engines demand the finest motor oils for lubrication. Sinclair is proud that it supplies 45% of all the motor oil used by major scheduled airlines in the United States. That is proof of the high quality of Sinclair lubricants. You can depend on them.

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For aircraft engine overhaul service, Pratt & Whitney Aircraft's Airport Department is "home" for many types of business aircraft. Like many of the nation's leading companies, you can enjoy the advantages and reassurances that go with engine work performed at the factory. It can cost less, too, in the long run.

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Certain types of engine parts repair, such as rebarreling cylinders or rematching crankcases, require factory facilities and factory methods that are available to you at the Airport Department. Complete equipment for all possible parts repair jobs—large or small—assures prompt dependable work.

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Expanded service hangar facilities can accommodate even the largest commercial aircraft. Service is prompt. Regular work includes inspections, engine changes, radio and instrument repair, airframe repairs or modifications, and general aircraft maintenance.

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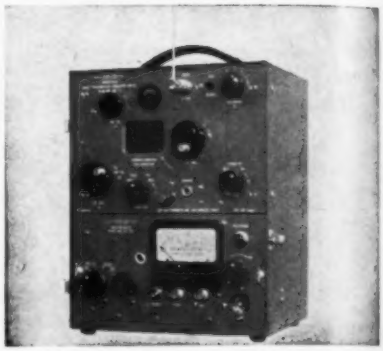
NEW PRODUCTS

(*Continued from page 66*)

The camera is equipped with a sub-miniature series wound motor.

Circle No. 156 on Reader Service Card.

MODULATION METER

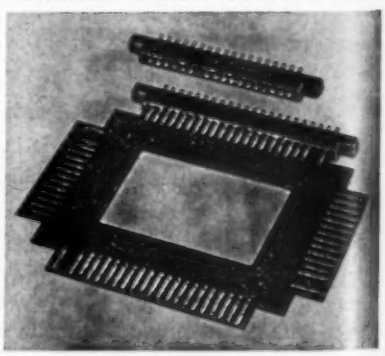


A completly transistorized peak modulation deviation meter has been added to the **Gertsch Products, Inc.** line of precision instruments. The new unit, with a deviation range of 15 kc full scale, is rated for 5% full scale accuracy.

Utilizing miniature components and transistor-type batteries, the instrument is designed to fit into the lower compartment of the Gertsch FM-3 frequency meter, or is available in a separate carrying case, and for rack mounting. The FM-3/DM-1 combined units are available. This unit measures and generates, with a rated accuracy of 0.001 percent, continuous frequencies from 20 to 640 mc. The FM-3/DM-1 is available in a portable carrying case.

Circle No. 157 on Reader Service Card.

PRINTED CIRCUIT CONNECTORS



A new connector for printed circuits is now supplied by **DeJur-Amsco** Corp. The contacts are supplied with Continental Connectors printed circuit receptacles and are available in single and double-row construction of 6, 10, 15, 18 and 22 contacts.

The connector with a bellows type design, accepts .054 to .071 variation of the standard 1/16-inch copper-clad

RECORD SIX YEAR PRODUCTION PAVES WAY FOR NEW GIANTS

Largest airframe assembly subcontracted. Ryan is producing huge aft fuselage sections for the Boeing KC-135 jet tanker-transport. This new project follows six years of continuous on-time production of fuselage sections for Boeing's KC-97.

It's a tail of two cities. The huge structures built by Ryan in San Diego must mate perfectly with sections produced at Boeing's Seattle-Renton plants. This demands precision manufacturing, perfect planning and flawless coordination.

Techniques, planning and skill save money. Ryan reduced costs 40% during production of KC-97 assemblies. This saving was passed on to Boeing and the Air Force – to provide more aircraft per defense dollar. This is just one example of the outstanding cost-performance at Ryan. The same manufacturing efficiency and smooth integration is found in the production of fuselage sections for Sabre Jet fighters and other military and commercial airframe components such as fuel tanks, control surfaces, wing sections.

Established, financially stable. Ryan performs subcontracts without progress payments from customers. A veteran of 33 years exclusively in the aircraft business, Ryan understands the industry's problems as only an aircraft company can. It has the modern facilities, most advanced manufacturing techniques, and highly skilled engineering and technical personnel needed to produce the industry's most difficult production assignments.

For 33 years, Ryan has excelled in designing and producing high quality aircraft, power plants and avionics – built at low cost, delivered on time.

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SAN DIEGO 12, CALIFORNIA

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Combines For the First Time

Pantobase

(All Bases)

and

BLC

(Boundary Layer Control)

It is with pride that Stroukoff Aircraft is producing for the United States Air Force the most efficient advanced assault air transport in the history of military aviation.

This development combines slow landing speeds through means of the Boundary Layer Control system, and includes the Pantobase installation, both designed by Stroukoff Aircraft Corporation.

The MS-8-1 is able to land and take-off from unprepared surfaces such as rough terrain, sand, snow, ice, ordinary runways and to operate from water as well. It will do so at low speeds never before possible with aircraft of its weight; and in half the area needed by its prototypes.

STROUKOFF AVITRUC

Stroukoff Aircraft Corporation

WEST TRENTON NEW JERSEY

Circle No. 35 on Reader Service Card.

NEW PRODUCTS

printed circuit laminated card. Wiring styles include solderless wire wrap, solder lugs, or taper pins for AMP 53. Various molding compounds are available.

Circle No. 168 on Reader Service Card.

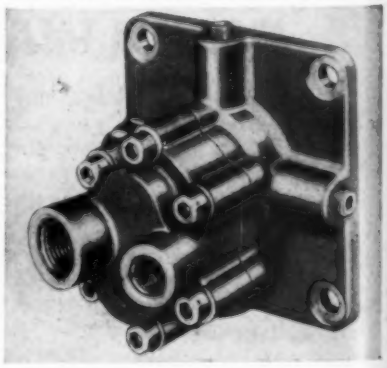
FUEL GAUGE TESTER

A Type MD-1 fuel gauge tester developed for the U.S. Air Force to test and calibrate aircraft capacitance-type fuel gauges has been announced by **Telectro Industries Corp.**

A direct-reading variable capacitor with a range of 10 to 6,200 $\mu\mu$f, the MD-1 tester is accurate to within 0.1%. Through the use of a main dial and a vernier dial, capacitance values in increments of 0.1 $\mu\mu$f are readily obtained, according to the manufacturer.

Circle No. 169 on Reader Service Card.

HYDRAULIC OIL PUMP



Lear-Romec Model RG-15130 rotary gear hydraulic oil pump is designed for use in ambient temperatures of —65° to 165° F. Weighing 2.6 lbs., it is built in a small envelope size and has heavy bronze bearings that are said to assure long life even though operating at high speed and pressure. Displacement is 0.18 cu. in. per revolution.

The pump has a standard mounting flange and 12-tooth spline drive to

(*Continued on page* 76)

WHAT CATEGORY OF ENGINEERING INTERESTS YOU?

Lockheed's, Georgia Division Engineering Branch, long range expansion program requires qualified Engineers in all fields: Design, Research, Laboratories, Structures, Flight Test, Dynamics, Preliminary Design, Operations Research------!

Advanced projects in large aircraft categories, Cargo, Bombers, Logistic Carriers are among the complex and interesting assignments in which this organization is actively engaged.

Qualified Engineers interested in becoming associated with this progressive Engineering Organization are invited to write to us in complete confidence.

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This is Lago do Moreno in Argentina. On the far shore a Swisslike village.

Some of the most heavenly places on earth are in South America

overnight from New York by Panagra DC-7B

It's a good thing cameras were invented so we can give you this glimpse of South America's beauty. *Most*, we'd like to take you there to see all the dramatic scenery and charming cities.

So near New York! Take the only DC-7B service to Argentina . . . radar-equipped *El InterAmericano*. Or save on *El Pacifico* DC-6. Both fly daily over the routes of National Airlines, Pan American and Panagra. Call your Travel Agent, National, or Pan American, U.S. Sales Agent for

Radar eyes in the nose of each *El InterAmericano* preview 150 miles of weather for the pilot. Result, smooth flight, day and night.

Pan American-Grace Airways **PANAGRA**

WORLD'S FRIENDLIEST AIRLINE

FUEL LOAD LIMIT CONTROL for the Viscounts

...Another SIMMONDS Pacitron "First"

Something *new* has been added to precision airline operation. PACITRON now makes provision for the use of *load limit control*, the automatic control of fuel taken aboard in accordance with flight plan requirements. Simmonds advanced electronic fuel gaging systems are now flying as standard equipment on the new Vickers Viscounts for U. S. and Canadian Air Lines. PACITRON capacitance fuel gage systems were specified to furnish these new turboprop transports with the most accurate method of measuring and managing fuel.

In addition to *load limit control*, PACITRON can include these additional fuel management functions: center of gravity control by fuel transfer or controlled usage, level switching signals, totalization and telemetering for remote readings.

Simmonds gages were also specified for measuring the water-methanol systems on the Vickers Viscount. In addition to fuel and water-methanol, Simmonds equipment has been successfully used for gaging engine oil, nitric acid and other hard-to-measure liquids.

Simmonds continues as "first in electronic fuel gaging."

The Extra Engineer—When Pacitron fuel gage system provides fuel management as well as fuel measurement.

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General Offices: Tarrytown, New York

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St. Louis, Missouri • Dallas, Texas • Wichita, Kansas
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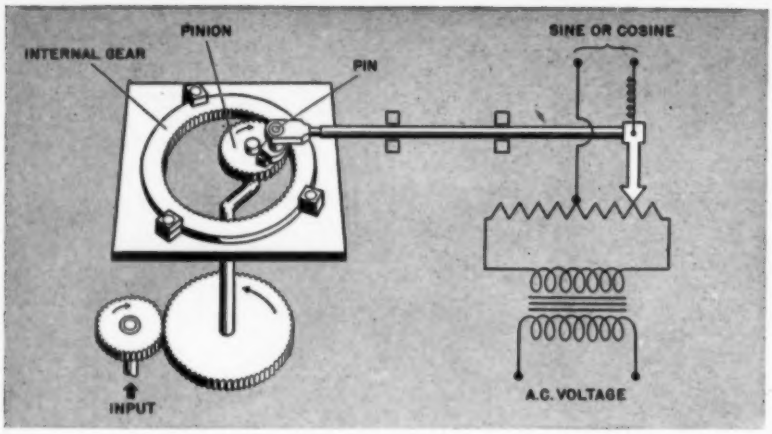
Circle No. 36 on Reader Service Card.

SINCE 1915 LEADERS IN AUTOMATIC CONTROL



Ingenious electro-mechanical device generates sine or cosine function

From a combination of mechanical and electrical principles, Ford Instrument Company engineers have produced and patented an electro-mechanical device to generate sine and cosine functions. The mechanical portion is an internal-gear angle resolver. It consists of two gears — an internal gear and a pinion. Because the pinion has exactly half the number of teeth as the internal gear, the pin on its pitch circle traces a straight line when the pinion rolls inside the angle gear.

Furthermore, the displacement of the pin relative to the center of the internal gear is proportional to the sine (or cosine) of the roll angle of the pinion.

If a linear potentiometer is now placed along the diameter of the internal gear and a potentiometer slider is fastened to the pin on the pinion, the voltage picked off by the brush is proportional to the sine (or cosine) of the angle.

Two such systems, connected in tandem, produce simultaneously both the sine and cosine functions.

This is another example of Ford Instrument engineering ingenuity. What appears on the surface to be a complex problem is solved by the combination of well-known principles.

Perhaps you have a problem that could benefit from Ford Instrument experience. Ford Instrument engineers work every day with systems using mechanics, electronics, hydraulics, electro-mechanics, magnetics, atomics. How can Ford help you?

79

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DIVISION OF SPERRY RAND CORPORATION
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of unusual abilities can find a future at FORD INSTRUMENT COMPANY. Write for information.

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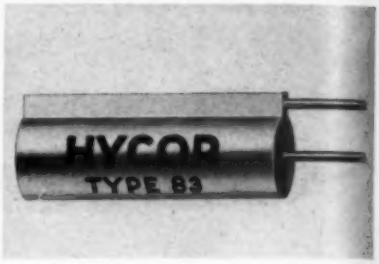
NEW PRODUCTS

(*Continued from page 72*)

mate with an AND 20001 engine pad. Seal is lubricated by hydraulic oil which is continuously returned to inlet side of pump. Rated capacity is 2 gpm at 3,750 rpm and 1,500 psi, 2 hp input.

Circle No. 170 on Reader Service Card.

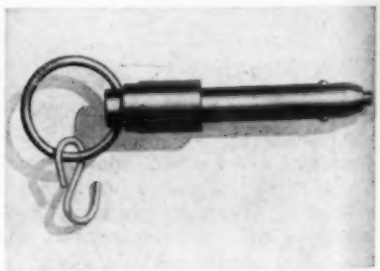
RESISTORS FOR AUTOMATION



The Hycor Co., Inc. is making Series A encapsulated resistors for use in printed wiring circuits. Designed to conform to RETMA specifications for components to be used in automatic assembly equipment, they are mounted in an epoxy compound and have sealed-in terminal connections. Wattage range available is 0.25 to 1 watt. Operating temperature is given as —65°C to —125°C.

Circle No. 171 on Reader Service Card.

PIP PINS

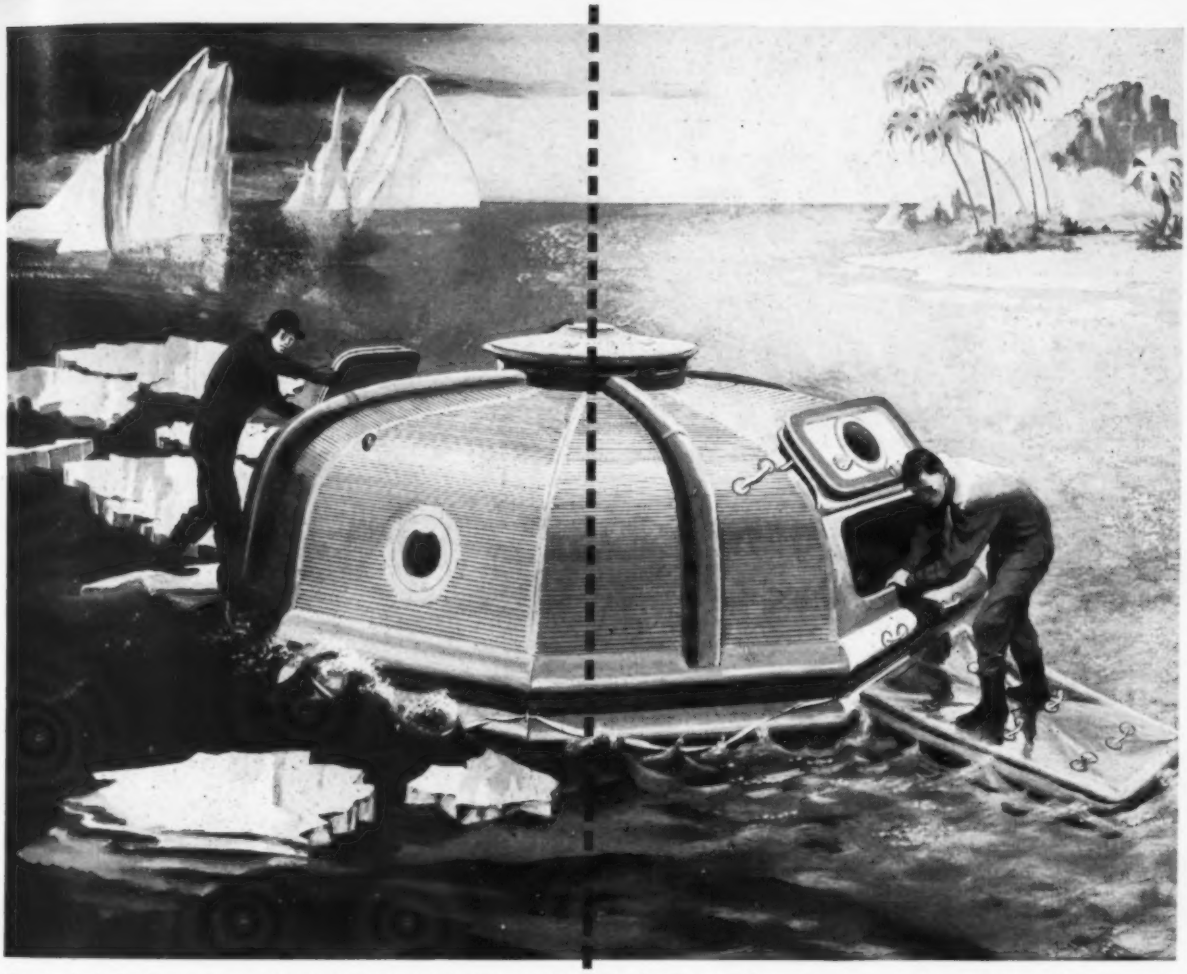


Aviation Developments, Inc. offers a new series of pip pins, designated Model B, for bracket, clevis, tube joining or similar uses in all critical military and aviation applications, as well as for commercial and industrial purposes.

While similar in appearance to previous models, used in many quick-disconnect requirements, the Model B pins are said to have two major improvements in addition to increased material strength.

Original pull rings were formed compression springs fitted into retaining holes in the spindle head. These have been changed to a continuous ring of substantial material thickness and useful diameter. Internally, the same basic spindle lock has been retained, but instead of being flush with the end of the pin is now extended beyond the tip.

Circle No. 172 on Reader Service Card



Now in final development, ***AIR CRUISERS' ARCTIC SHELTER — LIFE RAFT*** is the first significant improvement in survival gear for groups in extremes of weather on sea or land. Unaffected by heat or cold . . . by arctic or tropical waters. Inflates automatically in 10 seconds. Holds 20.

"Survival, Unlimited!"

Survival must not be limited to temperate weather, to easily accessible land areas or to gentle seas. Today a single air route may span desert, ocean, and arctic wastes. Today's survival equipment must serve anywhere — and serve well.

The leader in this highly specialized field is the Air Cruisers Division of The Garrett Corporation. This division is America's most experienced fabricator of inflatable rubber and rubberized materials. Air Cruisers is the only manufacturer conducting continuous research in survival at sea.

Contributing to this specialized manufacturing science is another Garrett division — AiResearch.

From their laboratories and engineering department come integrated components for automatic inflations which are the world's most advanced in design and the world's most exacting in quality.

Every significant development in survival equipment has had its origin at Air Cruisers. Its installations are standard on all the world's airlines. It puts no limit on quality in its steady advance toward the goal of Survival Unlimited.

AIR CRUISERS' AD-4 Life Preserver
the accepted standard for the world's leading airlines

AIR CRUISERS' MA-11 Life Preserver
finest one-man equipment for sea-combat survival

THE GARRETT CORPORATION

AIR CRUISERS DIVISION

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Pressurization and Air-Conditioning Systems

Superchargers—Air Cycle and Vapor Cycle Refrigeration

ASW Equipment

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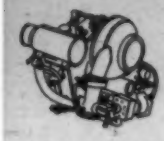
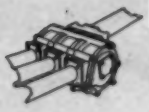
High Pressure Pneumatics

3,000 psi compressors rated to 11.2 cfm free air equivalent



Air Turbine Drives

For Alternators, Hydraulic Pumps and Emergency Power



Fuel Proportioners

Mechanical—Draw Fuel From Tanks in Predetermined Proportions

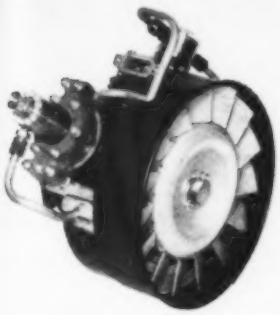
Valves and Controls

Pneumatic—for Temperature, Flow and Pressure Regulation

With manufacturing facilities on both the east and west coasts, Stratos is integrating many more products into its line of aircraft systems and accessory equipment.

In addition to pressurization and air-conditioning systems for aircraft, Stratos is now supplying high and low pressure compressors, turbo drives, valves and controls—a more complete group of pneumatic accessories and systems for many basic aircraft services.

Builders of systems and components for aircra

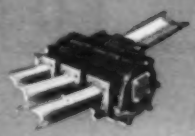


Model PCM3 3,000 psi Compressor, Delivers 11.2 cfm Free Air Equivalent

Model TP25 Turbine Drive for 15 to 25 KVA Alternators

Model TP15-2 Turbine Drive for 9 to 12 KVA Alternators

Model TP15-1 Turbine Drive for Hydraulic Pack

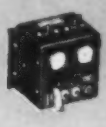


Mechanical Fuel Proportioner

Model TP3 Turbine-Generator Emergency Power Pack

Model 758 Ventilating Fan, Capacity: 900 cfm

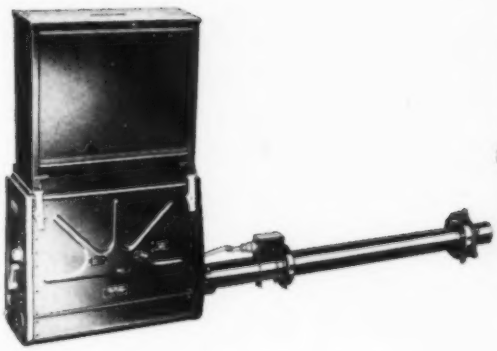
Model 747A Interlock Valve



Model 807 Retro Drift Signal Ejector Control

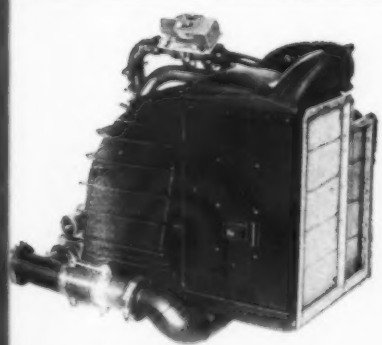
Model 753 Sonobuoy and Flare Release Control

Model 7008 Pneumatic Valve, 3,000 psi, 3-way, 2 position



Pneumatic Retro Marine Marker Ejector

Compressor, 2 cfm, 3,000 psi self-contained, electrically driven

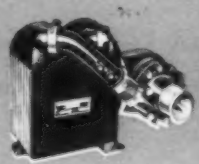


Model EA75 Refrigeration System— Nominal Flow Rating: 75 lbs./min.

Model 380-11 Cabin Supercharger

Model 380-5 Cabin Supercharger

Model B60 Bootstrap Refrigeration Unit



Model N15 Air Cycle Machine

Model MS60 Air Moisture Separator

Ball Valve for High Temperatures

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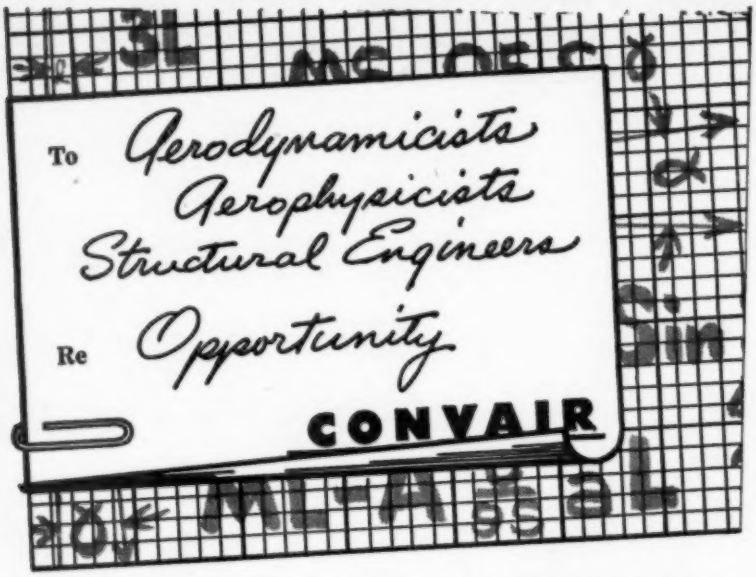

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As a division of General Dynamics Corporation, CONVAIR occupies an important place in the long-range development of the Nation's aerial defense as well as commercial aviation. CONVAIR'S activities afford inviting career opportunities for engineers, physicists and scientists — opportunities for professional accomplishment and personal income.

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Fort Worth in the Great Southwest has an abundance of sunshine and dry, fresh air conducive to outdoor living and recreation. Within a few minutes drive of Fort Worth are seven large lakes which provide ample facilities for fishing and other water sports.

For further details write M. L. TAYLOR
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A DIVISION OF GENERAL DYNAMICS CORPORATION
FORT WORTH, TEXAS

People

MANUFACTURING

Dr. Theodore Von Karman, senior scientific adviser on aeronautics to NATO and the USAF, named director of Gruen Precision Laboratories, Inc.

Kenneth C. Smith, formerly with Capital Airlines, appointed mgr. of sales and service for Continental Aviation and Engineering Corp.

Robert O. Vaughan appointed vp of National Aircraft Corp.

SMITH

VAUGHAN

Vice Adm. Charles Frederick Cee, USN ret., appointed asst. to the vice pres. engineering and military relations at Ryan Aeronautical Co.

Edward Glodeck named plans manager, Office of Development Planning, Glenn L. Martin Co.

George B. Gelly elected secretary of Douglas Aircraft Co. succeeding L. E. Tollefson, who is now Washington representative.

W. R. Miller appointed director of manufacturing of the Longren Aircraft Co.

AIRLINE

G. G. Brooder elected vice president of Western Air Lines.

Lawrence G. Fritz, American Airlines' vp-flight, retires November 15.

James J. Hartigan and **Bruce W. Bolton** to head up United Air Lines' cargo sales activities in the New York and Los Angeles areas, respectively; **Arthur W. Olsen** made city sales mgr. at San Jose; **Lyn Malin** named sales and publicity representative at Sydney.

Antonio Comellas appointed traffic and sales representative for Pan American World Airways in the Camaguey and Oriente provinces of Cuba; **Walter A. Elsaesser** appointed sales mgr. Portland, Ore., district.

Donald Hoirup named director of contract operations for North American Airlines.

Jack Nichols named asst. advertising director for Northwest Orient Airlines.

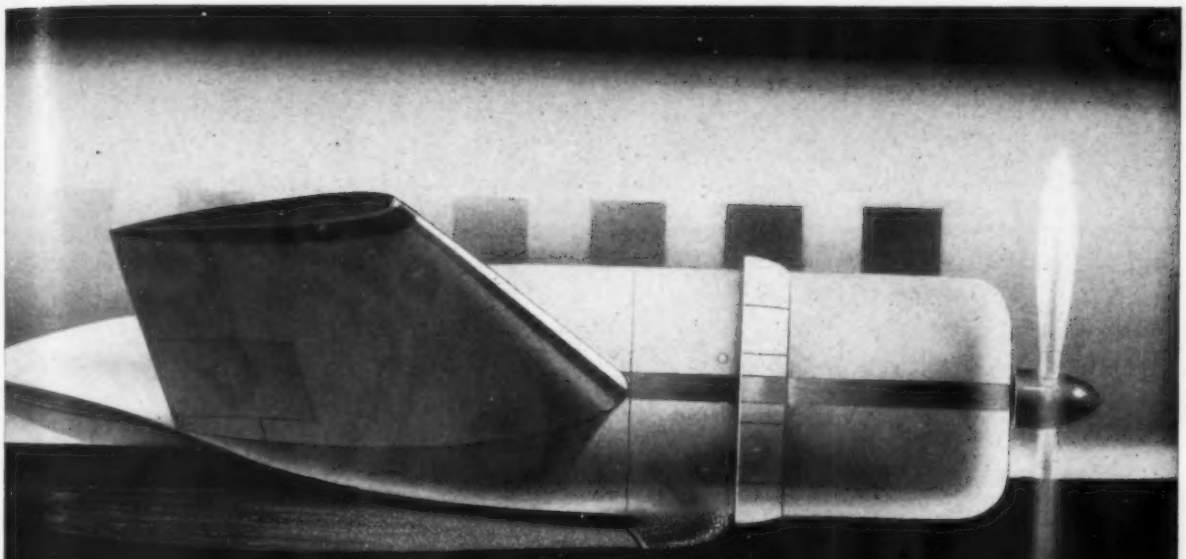
Capt. Edgar Johnston appointed International Advisor to the Management of Qantas Empire Airways, Ltd.

MILITARY-GOVERNMENT

Maj. Gen. Kingston E. Tibbetts succeeds **Maj. Gen. Phillips W. Smith** as Air Materiel Command Comptroller.

Rear Adm. John B. Pearson takes command of Bureau of Aeronautics' western district, headquarters, Los Angeles.

Robert C. Hill appointed special asst. to Under Secretary of State for Mutual Security Affairs.



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Flammable aircraft hydraulic fluids are one of the major causes of fire in flight. Should a hydraulic system leak, sparks, friction-heated metal, even a normally operating exhaust manifold, can ignite them! Prevent this danger by converting to Skydrol—world's only fire-resistant hydraulic fluid approved by the C.A.A. Now in use by 31 major airlines,* Skydrol has logged over 4,000,000 flying hours. It costs less than you think to convert your planes to Skydrol. For more information or FREE Skydrol technical bulletin, write Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Box 478-E-8, St. Louis 1, Missouri.

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LANDINGS TAKE MINUTES...FIRE DESTROYS IN SECONDS!
2000 feet per min. (Danger of structural failure from gust loads
1500 feet per min.
1000 feet per min.
Descent from 20,000 feet takes 10 minutes...15 minutes...20 minutes

The length of time required to land from high altitude emphasizes the danger of fires in flight. Skydrol hydraulic fluid helps prevent these fires because it is a fire-resistant chemical, not an oil. Skydrol also outlasts mineral oil, actually saves money.

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The SUPER 18 BEECHCRAFT is an airplane that can be purchased with confidence . . . not only in its ruggedness, reliability, and adaptability, but also with confidence that it will deliver the ultimate in comfortable air travel.

Statistics prove that corporation aircraft are more than FIVE TIMES safer than automobiles, measured by accident fatalities per 100 million occupant-miles.

Travel completely relaxed in your own transport at normal cruising speeds up to 215 miles per hour . . . with all the facilities for private consultation and deliberation while on the way on important missions.

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Weber Aircraft Corporation, 2820 Ontario Street, Burbank, California

CESSNA SELECTS WEBER EJECTION SEATS FOR SPLIT-SECOND SAFETY IN NEW TWIN-JET T-37 TRAINER

The new T-37 twin-jet trainer developed for the Air Force by the Cessna Aircraft Company of Wichita features two side-by-side Weber Ejection Seats to provide maximum safety and comfort of the flight instructor and cadet pilot.

Operates like combat-type aircraft

This new trainer incorporates all the latest equipment and design techniques of high performance jet aircraft. In addition to ejection-type seats and jettisonable canopy, the plane includes electric trim tabs and hydraulically actuated speed brakes.

Seating increases teaching efficiency

The T-37 is the first jet trainer to adopt side-by-side seating. It provides greater flexibility in training, as well as greater safety. The cadet gets the benefit of closer, more personal instruction, and the flight instructor is literally the cadet's right hand.

Cuts training time and costs

By introducing the cadet pilot to jet aircraft at an earlier phase of the training cycle, the T-37 reduces training time and costs. The side-by-side seating also allows for a smoother, safer transition than heretofore possible.

Seats undergo rigid testing

In developing ejection seats for high performance type aircraft, like the T-37, Weber carries out an exhaustive test program. Included in the test equipment maintained by Weber is an actual firing test stand where every prototype is given the full treatment. Extensive design, development and production facilities, have made Weber the leading producer of aircraft ejection seats. If you have any seating problems: pilot, crew, passenger or ejection, a Weber engineering team can solve it.

Cessna T-37, high performance, twin jet trainer

Weber ejection seats provide extra safety and comfort

Weber firing test stand checks out prototype

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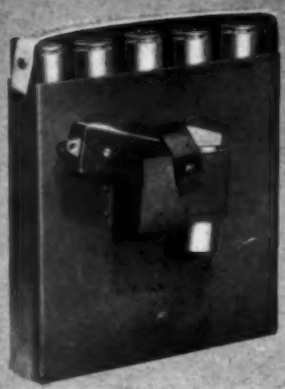

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37 mm Portable Kit
Five 1-minute Parachute Flares and 37mm pistol

- **MINIMUM WEIGHT**
  Entire kit loaded weighs only 11 lbs.
- **LOW COST**
  The lowest priced dependable signal outfit on the market.
- **PORTABLE**
  Can be removed when night operation not planned.
- **EFFICIENT**
  Each flare generates over 75,000 candlepower for more than a minute. Complete unit approved by C.A.A. for planes up to 3,500 lbs. gross weight engaged in miscellaneous operations.

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West Coast Talk . . . By Fred S. Hunter

- **Everybody, but everybody, wants bigger planes.**
- **Short field performance will aid Electra.**

EVERYBODY, it seems, wants bigger airplanes. Look at the Douglas DC-8. When it announced the jet, Douglas reported the domestic version would have a gross weight of 211,000 pounds. In no time at all it was up to 235,000 pounds and, after United Air Lines engineers put their pencils to work on it, the plane was weighing in at 242,500 pounds gross.

Hunter

Then there's Lockheed's Electra. The original Model 303 design at Lockheed was under 80,000 pounds. This contemplated a short and medium-range turboprop for a flight crew of two. With transition of the 303 into the Model 310, the flight engineer was back in business and the takeoff weight went up to 93,500 pounds, then 98,500 pounds, next 102,600 pounds (with tip tanks) and finally 110,000 pounds (without tip tanks) both for American Airlines and Eastern Air Lines.

If this trend keeps up, space for passenger's queues instead of aircraft gate positions will become the criteria for airport terminal facilities. At Los Angeles International Airport, with the present facilities, a lineup for a 140-passenger (UAL) DC-8 would go right out into the street.

* *

Most of the comment about the bigger wing for Lockheed's Electra has had to do with the increase in range which comes of the boost in fuel capacity, up about a thousand pounds. But don't overlook short field performance.

When it comes to 4,500- and 5,000-foot runways, Lockheed will have a jewel in the Electra with the increase to 1,300 square feet of wing area. It's surprising how many airports being served by airlines still fall in this category. In the long run, the Electra's improved short field performance will sell more airplanes for Lockheed than the improvement in range.

* *

Next month, December, will mark the start of the big job for the CAA's aircraft engineering division —type certification of the new turbine-powered aircraft. First type board meeting on the Boeing 707 will take place in Seattle early in the month. Also on the December schedule is the first meeting on Lockheed's Electra. The Douglas DC-8 is tentatively set to follow in January.

These new aircraft can be counted on to keep the boys in the CAA's 4th Region well occupied for the next four years—maybe five, counting in all the final cleanups. Job of work for Washington, too, particularly in the policy-making stages. There likely will be some merry hassles. Washington's participation on the type certification boards will be considerably greater than in the past.

* *

Comfort-loving pilots will bless Lockheed for the Electra cockpit. Big roomy office—54 inches between the two pilot seats. Moreover, Lockheed's crew seat competition, now in progress, specifies seats that slide sideways, elevate and recline as well as move forward and backward. Just like your living room.

* *

Somebody at North American the other day asked who was going to pilot the 100-mile high X job it is to design for the Air Force, Navy and NACA. "If our engineers run true to form," cracked a pilot who shall be nameless, "he'll be a midget."

* *

Allison has a tentative price of $22,000 to convert its 3,750-hp turboprop to the advanced 4,050-hp engine when the latter becomes available. The 4,050 has two transonic compressor stages and a potential of 4,500 hp, according to latest reports.

* *

At last reports, Douglas-Long Beach had two production RB-66s with all the fixes flying at Edwards, and performing in good style . . . North American's payroll at Fresno is approximately $200,000 a week . . . Al Goldberg, who used to be in charge of maintenance for the Flying Tigers and later North American Airlines, is now with Bedek Aviation at Lydda, Israel . . . Investment companies, who cooled on aircraft securities because of dwindling military orders, started asking questions again when they took note of the dollar volume of recent jet orders.

The modern, attractive Hertz counter above, located at the Spokane, Wash., Municipal Airport (Felts Field) is Hertz' latest addition to its long list of airport rent a car offices. This new office, like other new Hertz airport offices being installed all over the world, is helping to bring you new passenger revenue. And here's how it's being done!

Hertz opens new office at the SPOKANE, WASH. Municipal Airport (Felts Field)

Hertz, already at most major airports everywhere, expands again to bring airlines NEW PASSENGER REVENUE.

Hertz originated the Plane-Auto Travel Plan. Because of it, many travelers no longer drive from city to city just to have their car at their destination. Instead, they fly in speed and comfort—rent a Hertz car on arrival. And they're assured of a clean, new Ford Fordomatic or other fine car wherever they go. That's because Hertz serves them at more airports and more cities than any other rent a car system. In fact, there are nearly 900 Hertz offices in over 600 cities throughout the United States and most foreign countries.

To tell your passengers of the Plane-Auto Travel Plan, Hertz spends over $1,000,000 a year for advertisements in national magazines. No other company spends nearly as much to promote the Plan. Neither can any other company offer your passengers 10,700 clean, new cars . . . and more than 30 years' experience in courteous rent a car service.

Hertz also assures you of steady Plane-Auto Travel Plan business because more than 1,500,000 qualified persons now hold Hertz Charge Cards and Courtesy Cards. Hertz also honors Air Travel Cards.

How you can help sell the Hertz Plane-Auto Travel Plan

Promote the Hertz Plane-Auto Travel Plan in all your advertising, displays, folders and any other advertising and promotional programs. And best of all: *urge your ticket sellers and reservation clerks to ask your passengers this simple question:* **"May I reserve a Hertz car for you at your destination?"**

For complete information about the Plan, write:

HERTZ *Rent A Car* **SYSTEM**

Department C11, 218 S. Wabash Ave., Chicago 4, Ill., Phone: WEbster 9-5165

International Aviation

By Anthony Vandyk

Much publicized as it is, the Vickers Viscount is not the only British commercial aircraft regularly seen in the United States. The Viking, which also comes from the Vickers-Armstrongs stable, has been flying in and out of Miami for several years in the colors of British West Indian Airways operating under charter to BOAC.

Recently Miami has welcomed another type of British aircraft, the de Havilland Herons of Bahamas Airways. These four-engine landplanes are taking over several of the routes hitherto operated with amphibians.

The Heron's smaller brother, the twin-engine Dove, is now operated by Midway Airlines on its shuttle services in the Chicago area. Another Dove operator is Catalina Airlines, which uses the de Havilland aircraft to fly between Los Angeles and Catalina Island. The Dove, incidentally, has been one of Britain's best selling aircraft—450 have been sold in 35 countries.

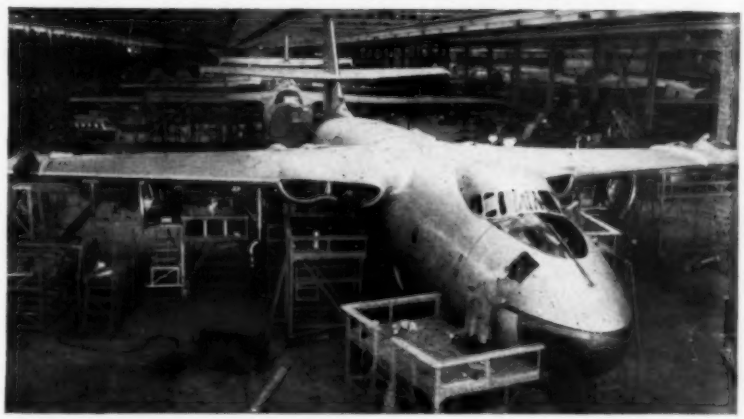
In Latin America, British commercial aircraft are a comparative rarity although they do show up in unlikely places. On the other hand, they are absent in territories where national considerations might favor their use. The airlines of British Guiana and British Honduras have no British planes. In French Guiana, on the other hand, the local operator — SATGA — uses a de Havilland Rapide. This twin-engine biplane is also used on the commercial services operated by Peru's quasi-military Grupo de Transportes (TAM).

In Argentina domestic carrier LADE operates Vikings while Aerolineas Argentinas links points on the River Plate with Short flying-boats. The latter equipment is also used by Uruguay's CAUSA for similar operations. The Short boats, incidentally, resemble the model which linked the U.S. with Bermuda for a short while in the late 'thirties' in the colors of Imperial Airways, BOAC predecessor company.

North of the border British aircraft are naturally more common than they are to the south. Trans-Canada Air Lines was the first North American airline to order the Viscount—and as such played a little-recognized role in subsequent sales by Vickers-Armstrongs.

Canadian Pacific Airlines broke the ice with the de Havilland Comet and, recently, with the Bristol Britannia. Apart from the Viscount, the main types of British aircraft in commercial service in Canada are the twin-engine Avro Anson and Bristol 170 and the four-engine Avro York.

Valiant Bomber Making Good Progress



VICKERS VALIANT jet bomber production is progressing well at Vickers-Armstrongs' Weybridge, England plant. Valiant is the first of Britain's "V" series bombers (others are Victor and Vulcan) to enter service with Royal Air Force.

British Still Favor Decca System

Clarifying Britain's position in relation to TACAN, the Ministry of Transport and Civil Aviation has reaffirmed its stand that, after prolonged evaluation, the Decca system comes closest to meeting requirements of the International Civil Aviation Organization in relation to air traffic control conditions. Thus Britain's short-range radio aid policy is to continue to support Decca, which the ministry has been backing for several years.

In Western Europe there is already complete Decca coverage for Britain, France, Benelux nations, Germany, Denmark and southern Sweden and Finland. The pictorial presentation of the Decca flight log, the ministry says, is by far the best short-range system for the crowded British airspace.

British plans for air traffic control include extension and improvement of Decca and interim installation of a few VOR beacons to give airway track guidance for international aircraft. The "Gee" system is acceptable for flying British airways where there is coverage (this is a fairly complete Royal Air Force installation). Most medium frequency beacons and ranges will be closed down and only a few 200 Mc/s DME beacons will be installed for BOAC.

Airline Briefs

Guest Aerovias Mexico has substituted L-749 Constellation equipment for DC-4s on its Mexico City-Miami route; carrier plans to inaugurate its Mexico City-Windsor, Canada, service in January . . . **Canadian Pacific Airlines** has inaugurated its Toronto-Mexico City service . . . **Air France's** management is asking the board of directors for permission to order 12 or possibly more SNCASE Caravelle jet transports . . . **SABENA** Belgian World Airlines plans soon to start service to Palma and Vienna . . . **BOAC** has applied to the CAB for permission to serve two additional U.S. cities—Detroit and San Francisco.

Trans-Australia Airlines reports a profit of $499,593 for its fiscal year ended June 30, 1955, compared with $257,566 for the previous 12-month period . . . Three Australian airlines—ANA, Ansett and TAA—have increased their first-class fares by 5% and their freight rates by 7½% . . . The Australian government is reported to have banned the import of the Bristol 171 and the two Westland S-55 helicopters ordered respectively by ANA and Molyneux "because civil rotorcraft cannot be classified as essential during the present period of financial stringency" . . . **Braathens SAFE**, Norwegian independent, has ordered a fourth de Havilland Heron.

Iberia has ordered two Lockheed L-1049G Super Constellations and five Convair 440 Metropolitans; the Super Connies supplement the three currently owned by the Spanish airline . . . **Middle East Airlines** has inaugurated a twice-weekly Beirut-Athens-Rome service with Viscount equipment . . . **Tasman Empire Airways** made its 10,000th crossing between Australia and New Zealand October 28 . . .

SIDELIGHTS ON THE SCIENTISTS

number **1** *of a series*

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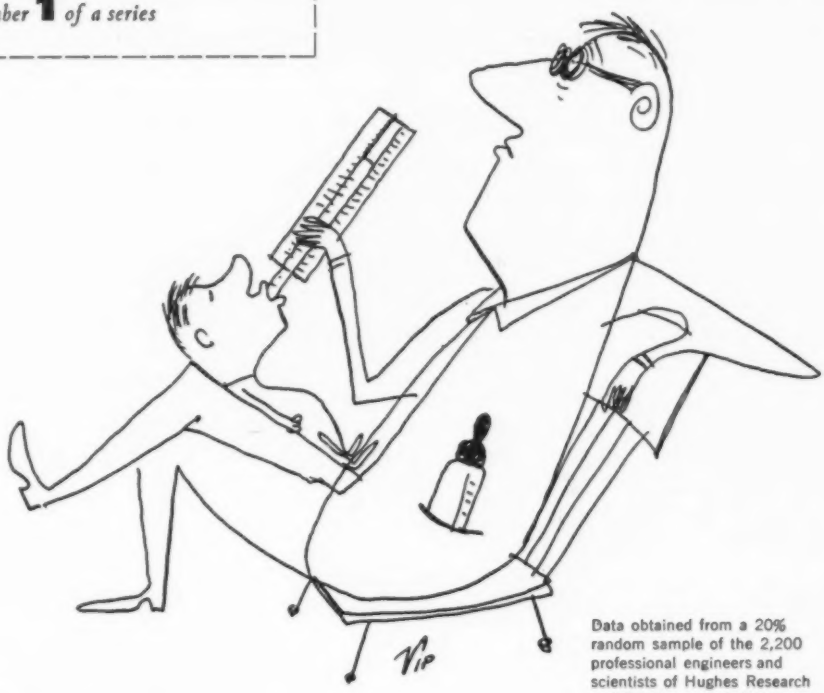

Scientists and Their Children

SOME OF THE YOUNG FELLOWS on our staff have been analyzing our files of personal data regarding scientists and engineers here at Hughes. What group characteristics would be found?

With additional facts cheerfully contributed by their colleagues they have come up with a score of relationships—some amusing, some quite surprising. We shall chart the most interesting results for you in this series.

* * *

IN OUR LABORATORIES here at Hughes, more than half of the engineers and scientists have had one or more years of graduate work, one in four has his Master's, one in 15 his Doctor's. The Hughes research program is of wide variety and scope, affording exceptional facilities for these people. Indeed, it would be hard to find a more exciting and rewarding human climate for a career in science. Too, the professional level is being stepped up continually to insure our future success in commercial as well as military work.

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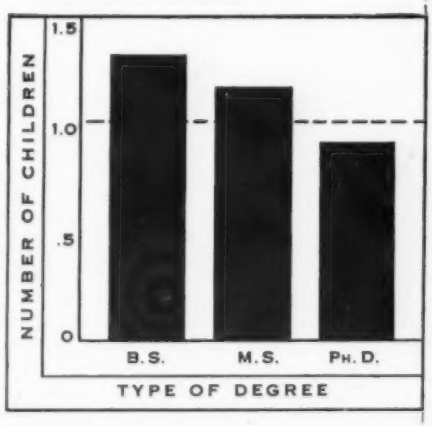
Data obtained from a 20% random sample of the 2,200 professional engineers and scientists of Hughes Research and Development Laboratories.



RIGHT NOW *the Ground Systems Department has positions for people familiar with transistor and digital computer techniques. These techniques are being applied to the information processing and computing functions of large ground radar weapons control systems.*

Scientific Staff Relations

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RESEARCH AND DEVELOPMENT LABORATORIES

Culver City, Los Angeles County, California

Growing Fast: Business Aircraft Leasing

Manufacturers, airlines, fixed base operators and others entering field as demand increases; many types of leasing arrangements.

By LOIS C. PHILMUS

The growing use of business aircraft, coupled with natural limitations on the amount of investment capital available for the purchase of such planes, has accelerated the development of numerous aircraft leasing plans in recent months.

Manufacturers, airlines, fixed base operators, used aircraft dealers and even business fleet owners are entering the leasing business.

Types of lease arrangements are as varied as the types of companies entering into such programs. There is complete unanimity among the group, however, on why companies are tending to favor leasing of planes for executive use rather than outright purchase.

Basic reasons are: (1) Eliminates necessity for having to invest working capital needed for business expansion in aircraft. (2) Greater tax benefits accrue from leasing since the entire amount spent in one-year period can be deducted, while investment in self-owned aircraft can only be written off over extended periods.

Complexion of Market

• **Contrary to** a popularly-held opinion, AMERICAN AVIATION has found that it is not the newcomer to executive aircraft use that makes up the leasing market, but rather the experienced operator. One of the largest categories to lease planes is the single-engine operator graduating to the small twin and thence to the larger multi-engine category.

The newcomer, it has been observed, tends to purchase low-cost single-engine aircraft. But once he gains experience here and goes on to the more expensive complex aircraft, lease programs give the user a chance to evaluate what type of larger aircraft best suits his physical and economic needs without gambling large sums of cash.

Another lucrative source for the lessor is the business aircraft operator in need of a spare aircraft while his equipment is in the shop for major overhaul. In another vein, certain companies only have a seasonal demand for aircraft, so naturally find it more economical to lease needed planes for the short term period.

Fixed-base operators and air taxi services lease larger aircraft in the Beech D-18S class for special charter or cargo work, rather than making initial capital investment in expensive equipment which may not pay for itself in enough special assignments.

• **As a result** of the newness of most of the lease programs and the absence of previous experience to draw on, most of the outfits engaged in the programs are reluctant to make over-optimistic predictions or estimates of the future or magnitude of the new service.

Forrest Beckett, Beech distributor and president of Lease Air, one of the oldest leasing companies in the country, observed that leasing's future depends on the money market. "If money gets cheap," he said, "aircraft users might again prefer to own their own aircraft." Right now, however, substantial capital is needed for business use.

Although Lease Air's contracts carry an option to purchase, Beckett has found that few take up the option. "The lease is easy to sell," he said. "What holds them is the simplicity of lease operation."

Beckett's company currently has leased out nearly $1.5 million in equipment (25 Beech planes) to 19 companies in packaged deals whereby Lease Air supplies the plane and crews. Planes leased are Bonanzas, Twin Bonanzas and Beech D-18S's. Beckett has been leasing aircraft since 1947. It now makes up the bulk of his business. He does his own financing through local banks.

• **American Leasing Corp.** of Hartford, Conn. has had an exclusive agreement with Beech Aircraft Company since earlier this year. American Leasing works directly with the distributors. When a customer signs the required four-year lease with a one-year additional option, ALC buys the leased aircraft from the distributor. The customer then makes monthly payments to a bank designated by the lessor.

Beech's Leasing Philosophy

Describing the plan in the *AVCO Bulletin*, Leddy Greever, manager of commercial sales of Beech, spelled out the leasing philosophy as follows: "Every financially balanced business has some working capital and some borrowing capacity. If it can operate successfully on its working capital, plus its borrowing capacity, as a general rule it has no need for any other type of financing. However, if new capital equipment is needed . . . and the combined working capital and borrowing capacity are insufficient to make the purchase, a leasing arrangement may be in order. In other words, the lease supplements working capital and borrowing capacity."

He notes that the industrial air fleet operator and the one airplane businessman are not in the airplane business. "They are merchants, manufacturers, brewers, oil men and others to whom planes are just another piece of productive equipment. They need to conserve their working capital, and for their businesses, the new aircraft leasing plan is tailored to order."

Queried on the progress of the plan, Kenneth J. Dorn of American Leasing said, that "due to the limited length of time which we have had to develop experience on our aircraft leasing plan, we do not choose to make public any facts or figures as yet," but he added: "The momentum which this plan is gathering very definitely leads us to the conclusion that it is a successful venture and that we have found a ready and acceptable market."

Cessna Subsidiary Offers Variety

• **Cessna has attacked** the manufacturer-lease plan in another way. Doing its own financing, Cessna has established a wholly-owned subsidiary—National Aero Finance Co. in Wichita. Ed Chase, vice president, noted that the program was formulated in response to heavy distributor demand.

The company offers a variety of plans on New Cessna airplanes. Said Chase: "We will lease any model new Cessna to a customer for four years or for two years with an option to renew for two more. We will also finance a dealer's lease for any period from three to 24 months."

National has found that the most popular lease to date has been for four years on a Cessna model 310. The lessee pays according to the following schedule: first two years, $30.65 per month for each $1,000 of list price; third and fourth years, $21.60 per month for each $1,000 of list.

In existence for just a little over five weeks, Chase noted that in three weeks four aircraft had been leased, three of which were 310s. The primary mission, he added, is the financing of

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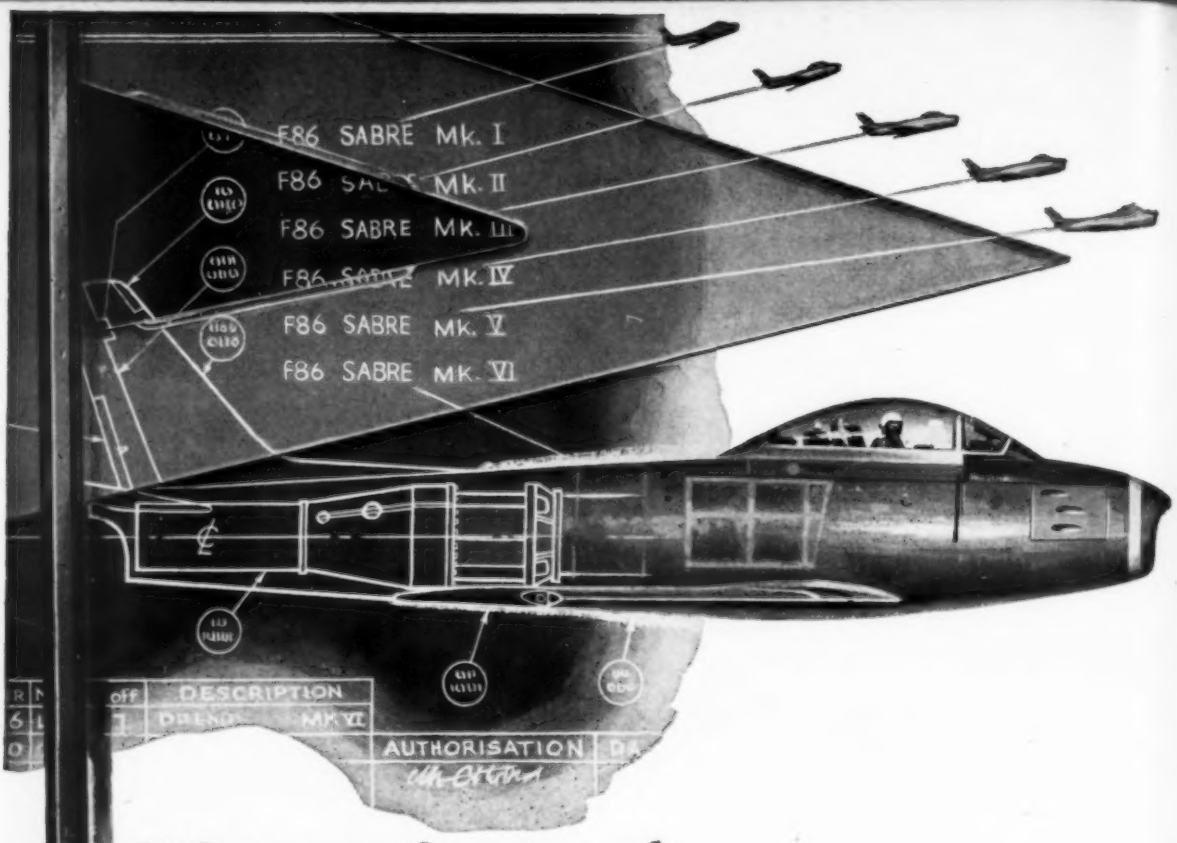
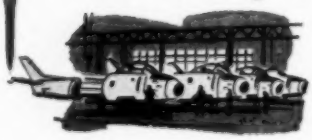


Whatever the aircraft . . .
Development counts at **CANADAIR**



It was recently announced that the latest Canadian-built F86 Sabre jet fighter can fly faster and climb higher than any other aircraft in European squadron service . . . practical evidence of Canadair's superior development and production facilities.

This is the sixth version of this famous fighter which has been produced continuously at Canadair without interruption of scheduled delivery dates. The outstanding record of the Orenda-powered Sabre VI can be credited to the intricate re-engineering of the airframe to take full advantage of the aircraft's new power plant — the Canadian Orenda 14.

In this job, as in the work now going on at Canadair to design and produce the CL.28, a maritime reconnaissance version of the Bristol Britannia, the RCAF depends on the imagination and "know-how" of Canadair's engineers. Like so many aviation experts around the world, they know that in every aspect of production, "You can count on Canadair".

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demonstrators and stock airplanes for the Cessna dealer organization.

• **A more limited market** lies in the leasing of used, larger transport aircraft. Leeward Aeronautical Service of Miami, Fla. is representative of this leasing field. W. L. Thomas, sales director, said: "We believe that there will be a continuing demand from executive users for transport type aircraft, but our experience during the past three years indicates to us that the major portion of our leasing requests during any one year can be accommodated, using no more than five aircraft—even though we have maintained a fleet varying from 12 to 20 aircraft at all times.

"We have found the principal users of transport type aircraft on lease arrangement are those companies which have had to decommission their company-owned aircraft for overhaul, conversion and/or maintenance. We have also found that a considerable number of users who anticipate the need of an aircraft for period of approximately one to two months have almost invariably continued the use of an aircraft beyond the initial period."

• **An unusual short-term** lease plan was recently inaugurated by Trade-Ayer of Linden, N. J. A used aircraft dealer, Trade-Ayer offers from time to time, on a month-to-month basis with no minimum hours, Twin Beeches, Doves, PBYs, A-20s and B-24s.

Two forms of lease can be obtained: What Fred B. Ayer calls a "dry lease," under the terms of which the lessee is completely responsible for the plane, i. e., crew, maintenance; or a "wet lease" where Ayer supplies crew, maintenance and complete package. "Each deal is tailored to the user," he added.

When the market goes slow, he observed, leasing helps the dealer realize at least a partial return on his investment in an airplane. "It might as well be put to work, as sit in the hangar," he said.

• **Speaking from** the operators' standpoint, Tillson Peabody, aviation director for General Motors Corp., said he "would advocate" leasing of aircraft "as a wonderful way for a company just starting out" to gain technical and operational knowledge by leasing a particular program.

Still another lease plan being used is being set up by fleet owners themselves. Typical of this type is a plan used by Executive Flyers, Inc. of Dallas. The firm, established by Col. D. Harold Byrd of the Byrd Oil Co., assigned its aircraft to the new organization and will use them for its own use and to hire companies on a per hour basis through lease agreements for either occasional or regular use. ◆◆◆

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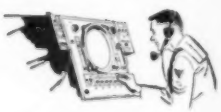

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TRANSPORT TRENDS

Washington, D. C., Nov. 21, 1955

THE TWO OKLAHOMANS who "sandwich" other CAB members in length of service on the Board—Josh Lee with 13 years and Ross Rizley with eight months—are virtually certain of leaving CAB at the end of the year.

Lee's term is expiring December 31 and is expected to be filled by Brooklyn attorney G. Joseph Minetti, currently a member of the Federal Maritime Board. Rizley, whose term still has five years to run, wants, and is expected to get, a Federal judgeship at the first of the year.

Lee, despite considerable support from senators, congressmen and several governors, is bowing to a firm Administration policy of replacing Democratic appointees of past Democratic administrations. Lee joined CAB in 1943 as a Roosevelt appointee.

Rizley, a Republican, is the only CAB member credited to the Eisenhower Administration, although the other Republican Board members were reappointed to new terms by Eisenhower.

In addition to two new members, the White House also is faced with appointing a new Board Chairman for 1956.

LONG EXPECTED BREAK between the Air Line Pilots Association and American Federation of Labor now looms as almost a certainty at the next AFL convention in December. Pending formal expulsion at that time, ALPA last week was suspended by AFL executive council for refusal to honor picket lines of Flight Engineers International Association in the latter's dispute with United Air Lines over carrier's new policy of hiring only pilot-qualified engineers.

And indications are that ALPA will neither press its case in the labor federation nor change its position in the United dispute. Now that a formal breach with AFL is in the offing, ALPA officials are reportedly being urged by members to jump at the opportunity to sever all AFL ties.

ALTHOUGH TOP LEVEL DISCUSSIONS on its design were just due to get underway at presstime, the "three-nation" turboprop being considered by Bristol-Canadair-Convair is still being shaped as a 1960 competitor for straight jet airliners. Powered by four Bristol BE 25 "supercharged" turboprop engines, it will gross between 170,000 and 200,000 pounds, seat 120 tourist passengers and fly at 460-500 mph speeds (at 30,000-36,000 ft. altitudes) over a 5,500-mile range.

SOME STRONG RECOMMENDATIONS on improved air transportation between the Pacific Northwest and Alaska may be forthcoming from Sen. Warren Magnuson (D-Wash.) before Congress reconvenes.

The Interstate & Foreign Commerce Committee chairman and a special subcommittee recently concluded several weeks of on-the-spot hearings and investigations in California, Washington and Alaska with regional spokesmen airing complaints of insufficient airline service.

Indications are that Magnuson's ideas will deal with permanency of carriers in the area, but not necessarily along the lines "demanded" by Pacific Northern Airlines' president Arthur Woodley during the recent hearings. Woodley charged CAB with hamstringing intra-Alaska and States-Alaska air transport and demanded special legislation granting permanency to qualified carriers serving the Territory.

U.S., Mexico Near Air Rights Agreement

Main stumbling block, American request for competitive nonstop rights between Mexico City and Los Angeles, believed removed.

By WILLIAM V. HENZEY

Authorities of this country and Mexico are closer to reaching agreement on bilateral air transport rights than at any time in the past four years.

In fact, depending upon the outcome of some confidential considerations, they may even be closer than the negotiating teams which came so near agreement after three weeks together in Mexico City in December, 1951. For the stumbling block at that session—a U.S. request for competitive nonstop rights between Mexico City and Los Angeles—no longer appears to exist.

Mexico is known to have indicated recently that it would consent to a U.S. airline in the Los Angeles-Mexico City market which has been operated exclusively for many years by Cia. Mexicana De Aviacion (CMA).

Equality Long Sought

• **The U.S.** has long sought such equality on the route and, as long ago as 1947, issued a certificate to Western Air Lines to provide the service. Along with certain other factors, the absence of a bilateral agreement has prevented WAL from activating the service.

The U.S. also has been seeking nonstop New York-Mexico City rights for a U.S. carrier as well as New Orleans-Mexico City rights. The latter is an operation for which Eastern Air Lines has held a certificate under circumstances identical to those of Western's in the Los Angeles-Mexico City market. Mexico, on the other hand, eyes the New York-Mexico City market as a must for a carrier of her choice. It has also been anxious to preserve a non-competitive status for the Mexico City-Miami route now operated by Guest Aerovias Mexico, S.A.

• **All such routes** presumably would be included in the new bilateral agreement, if accord can be reached on some finer points now under high-level consideration.

Despite the neighborly harmony which marks over-all relations between the U.S. and Mexico, the air agreement rift has required negotiations at the Ambassadorial level to bridge the gap of the past few years.

Still, some delicate moves remain to be made before an agreement is reached and much remains to be done within our own country before such an agreement can be implemented.

Certificates' Legality Uncertain

• **While Western and Eastern,** for example, have been issued certificates for services which the Mexicans may now be willing to authorize, the legal status of those certificates needs clarifications. So significant is this point that presumably only President Eisenhower can furnish the clarification.

Also, there is no decision yet on which of the three applicants—American, Eastern, or Pan American—will get the U.S. nod for a nonstop New York-Mexico City service.

But the uncertain status of individual U.S. operating rights has been more by design than accident. For it has been generally conceded that much of the trouble with Mexico has been our policy of predetermination. We normally select a carrier for a foreign route and then attempt to secure foreign approval of that selection.

Eastern and Western were so selected when certificates for Mexican operations were awarded them in 1947. Similarly situated was Braniff Airways.

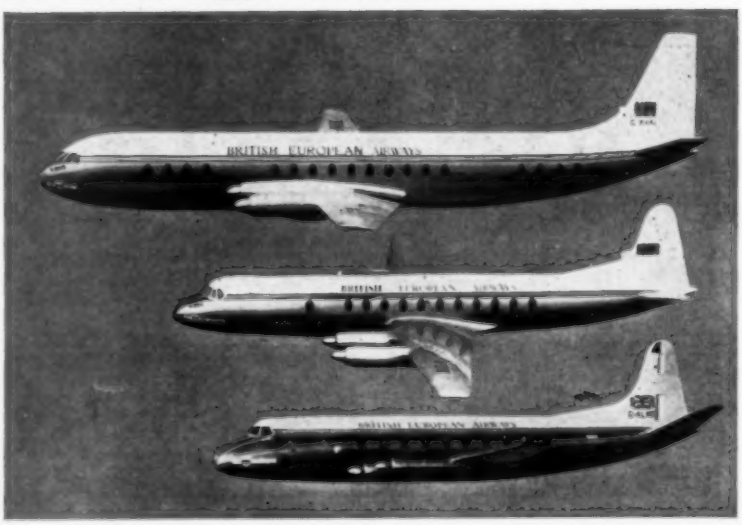
Truman Withdrew Approval

Since no agreement existed with Mexico and none could be reached by 1952, the "predetermination" was clouded considerably, if not removed, by former President Truman, who "withdrew his approval" of the three certificates.

As practical as that action may have been, its legality has been seriously challenged. For the past few years it has been studied by the Attorney General. It would not surprise many if, at a future date, Truman's "withdrawal" is withdrawn by his Republican successor.

• **Thus, if Mexico** were to agree to a U.S. carrier operating nonstop between Los Angeles and Mexico City, as appears highly likely, and Truman's

BEA Grows Bigger Viscounts



How British European Airways' future fleet of turboprop transports will compare in size. From top to bottom are Vickers 900 Vanguard, scheduled for 1960; Model 800 Viscount-Major, due for delivery next year, and Viscount 700, which BEA introduced in scheduled airline service in April 1953.

action removed from Western's 1947 certificate, Western would obviously be in a position to start service. There would be a route in the bilateral and WAL would have a U.S. certificate.

The same goes for Eastern in the matter of service between New Orleans and Mexico City. At this time, there appears little pressure for a Braniff route to Mexico. Even if the Truman action were voided, the absence of a route in the bilateral would render the Braniff certificate of 1947 of little practical effect.

Another Stormy Question

• **Of a different character,** but equally as stormy, is the question of a U.S. carrier to operate between New York and Mexico City nonstop. This question assumed added significance in January, 1954, when Air France was authorized to operate the nonstop route as part of its transatlantic services.

The only one-carrier U.S. airline service between New York and Mexico City, then and now, has been AA's one-stop schedules via Dallas. Reverberations can still be heard from the controversial "eight-minute" decision of CAB following the Air France Inaugural in early 1954.

That decision was a 3-2 vote in which CAB granted American an exemption to compete on a nonstop basis with Air France. Eastern and Pan Am went to Court and secured a stay order. Mexico, on the other hand, refused to grant AA the necessary permission. The exemption was thus negated and CAB eventually withdrew it in favor of a new route proceeding.

Applications of American, EAL, and Pan Am were consolidated in the new case and it became one of CAB's most controversial cases. Currently, it is at a virtual standstill.

CAB Heeds Eastern Pleas

• **Hearings were completed** on November 23, 1954. But in March this year, CAB heeded pleas of Eastern that classified files of CAB and State Department would most likely reveal evidence that all has not been cricket on the part of its rivals during the past eight years.

The Board ordered the route case held up pending a review of such classified files. The review has since been in progress on a confidential basis and its completion will be signalled by a decision by Examiner Edward T. Stodola on the question of whether further hearings are necessary.

Meanwhile, the case presents some interesting possibilities. For one, Pan American has based much of its case on the fact that the U.S. needs a transatlantic carrier to provide effective competition in the New York-Mexico City market. Air France, for example, can provide one-plane service from the Mexican capital to Europe.

Pan Am notes that a domestic or non-transatlantic U.S. line would only be able to offer a two-plane service for the Europe-Mexico traveler.

Also, there is growing sentiment in some high Government offices to reconsider past denials (or reasons leading to such denials) of Pan American applications which sought inside U.S. operating rights. The New York-Mexico City case, in which PAA seeks extension of its Mexico City-Houston route to New York, could be the testing point for such reconsideration.

AA's Arguments Plausible, Too

• **American's arguments** are equally plausible. It was, and is, the only U.S. carrier providing a one-carrier service between New York and Mexico City (with one stop at Dallas). It sacrificed its No. 1 role in the market to the nonstop services of Air France.

American argues that a virtual "third party"—France—has been given rights denied to carriers of the two countries directly concerned.

Eastern too, has a case that can't be taken lightly. It claims access to the "middle-route" between New York and Mexico City, through its connecting service with Pan American at Houston. Since it has New York-New Orleans rights under its domestic certificate, it would have had a through route to Mexico via New Orleans if ever permitted to activate the 1947 certificate for New Orleans-Mexico City service.

Currently, bilateral negotiations with Mexico are not being handled by negotiating teams. Formal and informal hints and suggestions, perhaps even a "white paper" or two, have been exchanged at some very high levels. CAB is not now actively participating in the exchanges but, could, if the favorable outlook of the past month develops further, move into the picture in December. ◈ ◈ ◈

Top Designers, Seat-Makers Give New Look To Electra Interior

January 10, 1956, is the day Lockheed is scheduled to have the finished mockup of the turboprop Electra—including passenger seats and interior fittings—ready for showings.

Previously, the mockup has been used for space purposes only, with changes taking place practically from day to day in the campaign to develop maximum cabin comfort—and provide a smart, sexy-looking decor to add to the aircraft's passenger appeal.

Two top designers will be contributing to the ultimate interior styling of Electras. One is Henry Dreyfuss, the industrial designer who was so successful in brightening up the Super Constellations and now is regularly retained as a consultant by Lockheed. The other is Harley Earl, General Motors vice president of styling, who got into aircraft design work helping Eastern Air Lines put extra oomph into its DC-7B interiors. He'll again lend a hand in

ELECTRIFYING CONVERSATION?—Capt. Eddie Rickenbacker, (right) board chairman of Eastern Air Lines, discusses the turboprop Electra with Hall L. Hibbard, (center) Lockheed's engineering vice president, and H. B. Coon, EAL adviser, during visit to Burbank to see the early mockup. EAL has ordered 40 Electras.

dressing up the Electra cabin for EAL.

• **The finished mockup** will mark culmination of a seat competition in which all the country's better aircraft seat-makers were invited to submit proposals for a new style in aircraft passenger chairs for the Electra. After analysis of these proposals, Lockheed set up what might be called a Phase 1 competition for mockup models between four selected manufacturers and then followed this elimination with a Phase 2 competition for prototype first articles. Aerotherm and Weber Aircraft were the survivors.

Final selection will be made between the designs of these two winners. Both, it might be added, have a new "look" in seats.

Lockheed gave the seat designers ample weight latitude with a specification of 67 pounds for a double seat for the four-abreast standard fare Electra. The specifications call for the deluxe seats to be 20 inches wide between wide armrests. Center armrests may be folded flush. Fore-and-aft spacing is 38 inches. Aisle width is 22 inches.

• **Each seat** will be equipped with its own individual foldaway service table, an expedient to make it easy for the passenger and even easier for the stewardess. At 66 passengers and up it is considered possible these built-in, utility-type trays may save an extra stewardess on meal flights where the flight time is short.

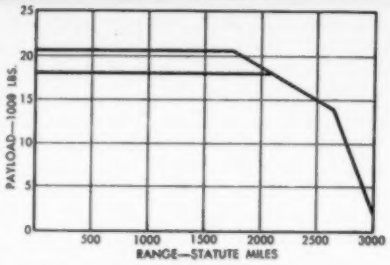
Departing from the recent trend, Lockheed does not contemplate seat tracks in the Electra. These undoubtedly will come later when there is more interest in configurations of higher density, but at the start Lockheed is more interested in comfort for the passenger than in flexibility for the operator.

Interiors, however, are convertible simply by reinstallation of seats. No other basic changes are necessary. Galley design is being left strictly to the airlines on the theory they are their own best experts in this department.

• **A recent Electra change** is the addition of an aft passenger loading door to supplement the main door forward in accordance with a request from American Airlines. AA decided more than one door will be needed to expedite loading and unloading of higher density aircraft on certain occasions.

Lockheed continues to make integral stairs standard equipment for the forward door, but for the new aft door they will be optional. AA does not plan to have the aft stairs installed and will use ramps at the airports where the aft door is used.

Lockheed has decided to go to triple windows for the Electra cabin, not so much for pressurization loads as to offset temperature extremes, such as maintaining 75°F in the cabin against



ORIGINAL ELECTRA DESIGN gave the above payload/range relationship. Recently the plane's wing area and tankage were increased, thus improving range capabilities.

60°F below zero outside. No one will lean against a cold window in the Electra, says Lockheed.

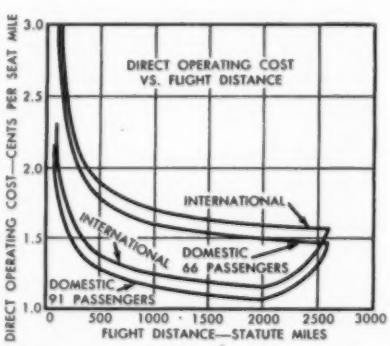
• **Another Electra innovation** in Lockheed's all-out program for comfort and luxury will be the use of electric-blanket type heating, instead of hot air, for the cabin sidewalls for cold weather operation. Electric resistance heating elements, with fans, also will be installed in the belly compartment to serve the dual purpose of keeping passenger luggage at even temperatures and help keep the floor of the airplane warm.

Lockheed's Electra will be pioneering in the application of an alternating current electric system to commercial transports. Instead of generators, it will have four alternators, one for each engine, and two working bus systems.

The Electra might be described as an "electric airplane" because of its more extensive uses of electric power. In addition to cabin sidewalls and belly compartment, electric heating will be employed for propeller and spinner anti-icing, and for de-fogging and anti-icing of the windshield.

Instead of the de-icer boots characteristic of its Constellations, Lockheed will bleed from the Allison turboprop engines for thermal anti-icing of the wing and empennage. The Electra, Lockheed engineers report, is being designed so it can operate in ice at cruise power.

• **Pressure for** the Electra's cabin—



LOCKHEED ELECTRA's direct operating cost comes down to less than 1.5 cents per seat-mile for most flight distances with 91 passengers.

for a maximum altitude of 8,000 feet at an airplane altitude of 30,000 feet —will be furnished by two centrifugal compressors mounted on the inboard engines. By using the heat from these supercharger compressors for the main cabin heat supply, Lockheed will avoid the use of internal combustion heaters in the Electra. This method, augmented by the auxiliary electric resistance heating, is simpler and safer, Lockheed says, and will provide less variations in temperatures between different sections of the cabin.

An air cycle system will provide cabin cooling in flight in summer, augmented by a Freon system for ground cooling.

When the finished mockup is all in place in Lockheed's new mockup building in Hangar 2 at Lockheed Air Terminal, Lockheed anticipates customer enthusiasm for the plane's numerous interior innovations will be greater than for any other airplane it has ever built.

IATA Meeting Votes 10% Fare Increase

A 10% increase in many first-class fares effective April 1, 1956, was decided by the International Air Transport Association's Joint Traffic Conferences meeting in Miami Beach last month.

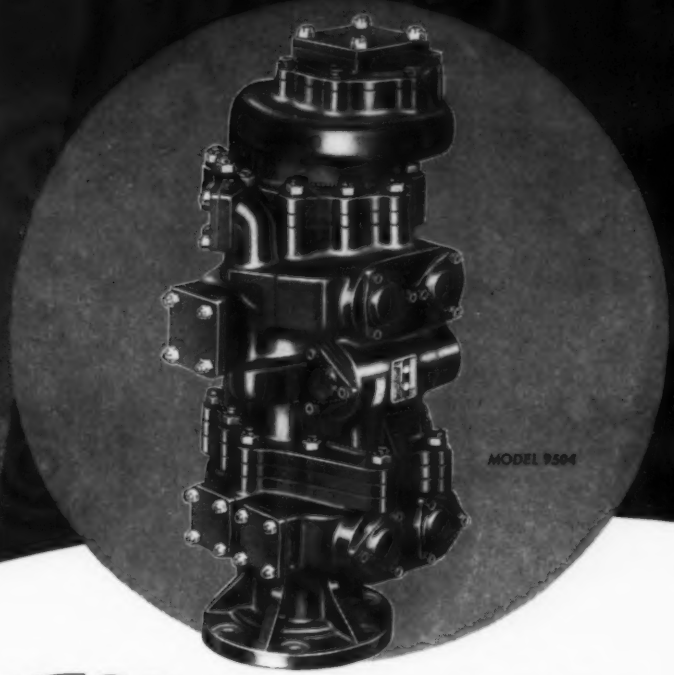
The increase will apply to all first-class fares except: there will be no increase within the Americas or on routes from Australia to South Africa, Tokyo and New Zealand; smaller increases, about 5%, will apply between Europe and India and over Pacific routes.

Tourist fares will be unchanged except for a $10 increase on the mid-Atlantic route. Within the Middle East, the number and extent of "B-class" (lower than tourist) fares will be increased. Sleeper surcharges will be increased by 10% to $55.

General cargo rates will be increased by about 5% in the South Atlantic routes and on routes between Europe and the Middle East and Far East, excluding Australia and New Zealand, and southbound only from Europe to points in Africa.

Other decisions by the IATA meeting included: abolition of the "open-jaw" discount, in which round-trip discounts are given despite an open segment at one end of a trip; reintroduction of the North Atlantic family-fare plan for the 1956-57 winter season; launching of a statistical survey of the booking situation in 26 airlines during representative on- and off-season weeks and adoption of a new reservations interline message procedure called AIRIMP, to supersede the Universal Interline Reservations Code.

There IS a BIG difference in fuel pumps



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Not by unsubstantiated claims . . . not on the drawing board . . . but by thousands of dependable hours *in the air* under every conceivable flight condition, CECO Fuel Pumps have *proved* there *is* a big difference in pump performance.

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Airlines Reject Code on Liquor; No-Show Penalty is Stalemated

Domestic airlines have turned down a proposed "code of practice" covering serving of alcoholic beverages aloft. Rules covering liquor service are the responsibility of individual companies, they said.

The companies also again failed to act on a penalty plan designed to curb no-shows and late cancellations.

The Air Traffic Conference, meeting in San Francisco this month, heard Harold L. Pearson, Air Transport Association president, present a liquor code and then issued the following statement:

"It was the general feeling of the airline representatives . . . that the decision to serve alcoholic beverages aloft and the rules and regulations governing such service are the responsibility of the individual airline companies."

• **Pearson in September** had written company presidents proposing 15 points for consideration in a code which he said he would present at the November ATC meeting. His action followed receipt of a letter from Joseph P. Adams, acting chairman of the Civil Aeronautics Board.

Adams, emphasizing that CAB's sole interest in the matter was safety, asked that carriers advise CAB of any untoward instances which had occurred and also to advise of any policy decisions which may have been reached.

• **The controversial** no-show penalty plan issue reached a stalemate when a committee of sales vice presidents, headed by James Mariner, Northwest Airlines, was unable to present a unanimous recommendation to ATC. It was the third failure by ATC in six months to reach agreement.

The committee had attempted to agree on a "recommended practice" which would have had considerably less effect than an ATC resolution and which contained no cash penalty. It would have served as a guide to airline managements at the local level in adopting uniform practices covering advance ticket purchases.

The recommendation, which was not brought to the floor because of United Air Lines' dissent, would have required a passenger making a reservation more than 24 hours before flight to signify his intention to use the space (1) by buying a ticket 12 hours in advance, or (2) if this were impossible, by calling the company 24 to 12 hours in advance and verifying that space will be used. Failure to follow these courses would result in cancellation of the complete itinerary.

On reservations made within 24 hours of flight, efforts would be made to have tickets picked up six hours before departure. If this failed, however, purchase could be made at departure.

• **Arthur F. Kelly,** v.p.-sales of Western Air Lines, was elected ATC president for the coming year, succeeding Robert Turner, v.p-sales of Northeast. Other new officers are Rex Brack, v.p.-Traffic and sales of Braniff, 1st v.p.; John Clemson, TWA's general sales manager, 2nd v.p. ◈ ◈ ◈

RB-109 to Fly in Early '56

Rolls-Royce, Ltd.'s two-shaft, high compression RB-109 "Tyne" turboprop engine, powerplant for the recently announced Vickers 900 Vanguard transport AMERICAN AVIATION, Oct. 24, p. 162), is slated to fly early next year.

Plan is to install an experimental RB-109 in a specially adapted Lincoln flying test bed and to follow that program with installations in Ambassador aircraft for scheduled service operation, possibly as Airfreighters.

R-R has now built three experimental RB-109s and more are being constructed for development purposes. Initial test bench running took place last spring.

RB-109 performance details, first officially disclosed by Rolls, follow:

Takeoff

Power .....4,020 shp *
Total equivalent power ..4,470 tehp **

Cruise (25,000 ft./425 mph)

Power .....2,270 shp
Total equivalent power ..2,470 tehp
Specific fuel
consumption .....0.414 lb./hr./tehp

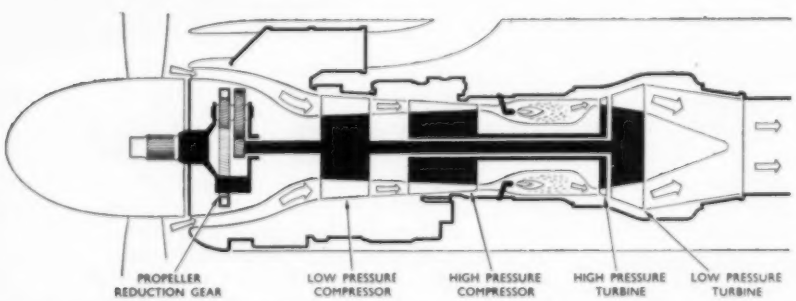
Weight

Net dry weight .....1,880 lbs.
Specific weight .....0.42 lb./tehp

Dimensions

Length (to cone fitting line) ..97.15 in.
Height .....40.5 in.
Width .....37.4 in.

* *shp—shaft horsepower*
** *tehp—total equivalent horsepower*



AIRFLOW DIAGRAM of Rolls-Royce RB-109 turboprop engine shows two-shaft design. First flight in a Lincoln flying test bed is now scheduled for early 1956.

Rizley Cracks Down On CAB News Leaks

CAB Chairman Ross Rizley cracked down on leaks within the Board this month, threatening to call in the FBI if the situation does not clear up.

Rizley's criticism resulted from premature publication in certain western newspapers of CAB's decision in the Denver Service Case.

The Board Chairman, who insisted at the outset of his term last April that he would enforce the Board's code of ethics, called Board Members and staff officials to a special meeting on Nov. 8.

He said other Federal agencies have seen fit to call in the FBI and hinted strongly that such would be the case in CAB if and when the next leak occurs.

Newspaper accounts, which included new route awards in detail, even listed the Board's release date as Nov. 7. This proved particularly irksome to Rizley and, for one reason or another, that "release" date was not met.

CAB currently is sitting on another major case—the Southwest-Northeast Proceeding. That decision is also expected momentarily but premature release of details could blow the lid off at CAB.

We're Sorry

As the result of a typographical error, the pressurization capabilities of the Boeing 707 were incorrectly presented in Vernon Crudge's account of a nonstop cross-country jet flight in the November 7 issue of AMERICAN AVIATION (p. 32). The third paragraph should have read: "from 39,000 feet and pressurized to an altitude of 6,700 feet" etc. AMERICAN AVIATION regrets the error.

Gulf announces a

New Aircraft Engine Oil

...proved 5 ways better!

1. **Improves internal engine cleanliness**
2. **Minimizes sludge and oil inlet screen deposits**
3. **Lowers rate of parts replacement due to wear**
4. **Low pour point for ease of starting even under severe winter temperatures**
5. **Increases periods between engine overhauls**

NEW GULF AIRCRAFT ENGINE OIL is available in four S.A.E. grades (30-40-50-60) to provide packaged straight mineral aircraft engine oils for *both* radial and horizontally opposed engines used in commercial service.

You can count on getting trouble-free service from Gulf's new Aircraft Engine Oil. It has been extensively flight service tested in all types of air-cooled engines by private operators, executive fleets and airlines.

These operators report cleaner oil inlet screens, remarkable freedom from piston ring and valve sticking and reduced rocker-box coking. It all adds up to the fact that *Gulf's new high-quality Aircraft Engine Oil gives maximum operating efficiency and increased periods between engine overhauls.*

So the next time your plane is serviced make it new Gulf Aircraft Engine Oil and find out for yourself.

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NEW Bendix MARKER RECEIVER

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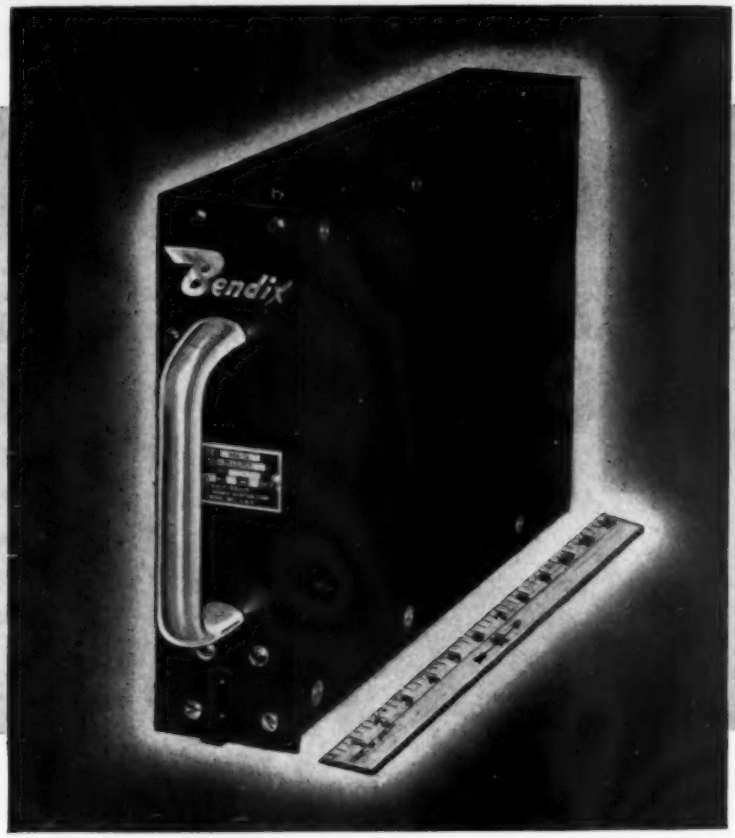

Compact...Rugged...Weighs only 8½ pounds!

Now from Bendix*, makers of the world's standard in Marker-Receivers, comes a big advancement—the MKA-7A. Completely new from chassis to case, the Bendix-MKA-7A Marker-Receiver is designed for dependable, trouble-free reception of signals from airways fan markers, station locator Z markers and ILS approach markers.

Smaller in size, lighter in weight, it is scheduled for use in Pan American Airways new fleet of DC-7C's.

Operating on a fixed frequency of 75 megacycles, the MKA-7A features improved circuitry that performs a two-fold function:

(1) Greatly reduces the chance of television or FM interference.

(2) Stabilizes gain under wide ranges of environmental conditions and line voltage fluctuations.

For further information, contact your Bendix Aviation Radio representative or write the factory direct. Address below.

*Reg. U. S. Pat. Off.

SPECIFICATIONS

Antenna transmission line input impedance	52 ohms. Voltage standing wave ratio less than 1.2 to 1.
AVC characteristics	Audio output is within a 6-db range at r-f input levels from 400 to 200,000 microvolts.
Selectivity	Attenuation — Total Bandwidth 6 db — more than 40 kc 60 db — less than 250 kc
Frequency stability	± 10 kc under all service conditions.
Undesired response rejection	Interference from adjacent channel television signals will not produce lamp threshold at input levels up to 3.5 volts.
Audio output impedance	500 ohms, nominal.
Power requirements	*AC Power Supply* 115 volts ac, 300-1000 cps, 35 VA with 27.5 volts dc for ON-OFF relay control. or *DC Power Supply* 27.5 volts dc, 36 watts.
Altitude performance	Operates at barometric pressures equivalent to 30,000 feet altitude.
Ambient temperature rating	−40°C to +70°C (−40°F to +158°F).

Specifications subject to change without notice.

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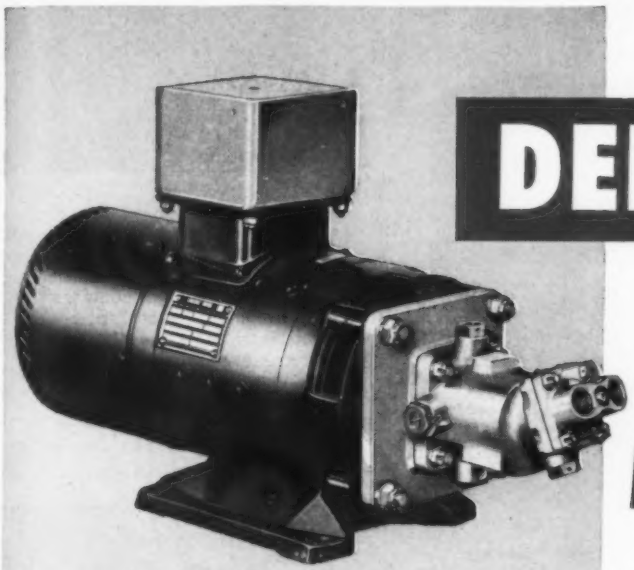
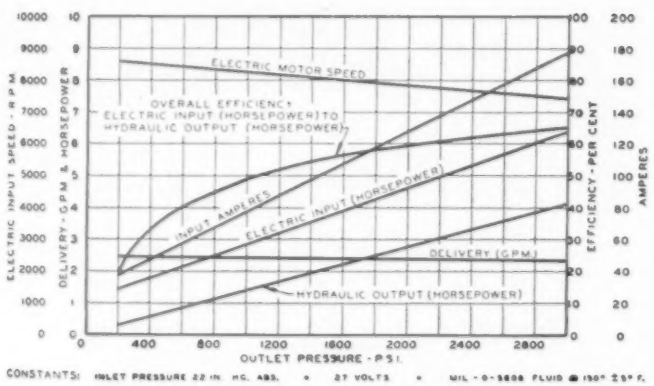


Model AA-19033. Vickers Electric Motor Driven Auxiliary Hydraulic Pump for 3000 psi.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These Motorpumps have accumulated remarkable records of dependability on numerous military aircraft and major airlines.

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Vickers Piston Pumps have 92% overall efficiency . . . resulting in higher motorpump overall efficiency.

★ **LESS WEIGHT**
High pump efficiency and low starting torque permit use of a smaller, lighter electric motor. Total weight of Model AA-19033 is only 33.9 lb. including radio noise suppressor (3.4 lb.); hydraulic pump weighs only 2.18 lb.

★ **EXPLOSION PROOF**
Conforms to Specification MIL-M-8609.

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The more efficient pump means less current drain . . . longer emergency operation.

★ **DIRECT DRIVE — NO GEARING**
Ability of pump to operate at high speed permits direct drive at 7500 rpm.

★ **LOW STARTING TORQUE**
Less than 10% over maximum running torque.

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

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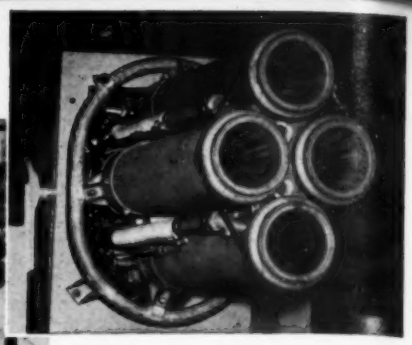


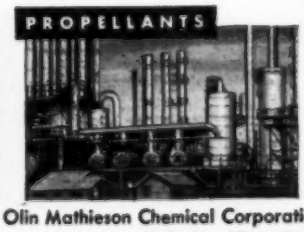
In the field of fuels research, Olin Mathieson and Reaction Motors are developing new liquid and solid propellants as well as additives to improve current propellants. Reaction Motors and Marquardt Aircraft establish specifications for these new rocket and ramjet fuels and test and evaluate their capabilities for meeting tomorrow's needs.

developing super fuels for supersonic propulsion

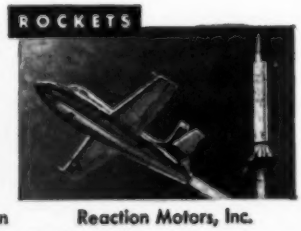
Applying the modern "weapons system" concept to the problems of supersonic propulsion, Olin Mathieson, Reaction Motors, and Marquardt Aircraft are combining their unique skills and experience in the development and production of rockets, ramjets, and special fuels. Coordinated by the OMAR Joint Technical Committee comprised of representatives of the three companies, this applied research program is dedicated to the practical advancement of supersonic aircraft and missile propulsion.

3519

Marquardt Aircraft Company



Olin Mathieson Chemical Corporation



Reaction Motors, Inc.

Circle No. 27 on Reader Service Card.

Airline Commentary

By Eric Bramley

Can an airplane do as much work in a month as a ship? Seaboard & Western Airlines is hauling military dependents under contract—91 per trip—across the Atlantic in Super Connies (91 passengers, three stewardesses—one of whom is a registered nurse—and five to seven crew members). Under current contracts, three planes are making 36 round-trips a month, or an average of 12 per plane. Thus, one plane will carry 1,092 passengers one way or 2,184 both ways, in a month. Or, as much work as a 500-passenger ship can do in two monthly crossings.

Trend of the times: The CAA, illustrating its point that the air traffic control problem is getting more and more serious, tells us that at certain times of the day there is even a "traffic jam" on the North Atlantic, between Gander, Newfoundland, and Shannon, Ireland.

We had a good argument going a couple of months ago about which scheduled airline stop had the smallest population, but Robert Allender may have killed the whole thing. Mr. Allender, publicity manager of Tasman Empire Airways Ltd., writes from New Zealand to enter a claim for Akaiami, at Aitutaki in the Cook Islands. Akaiami, the islet near which TEAL's flying boat lands, is totally uninhabited—which leaves little room for argument.

"On aircraft movement days, residents of the main island of Aitutaki come across and staff our rest house on Akaiami," he says. To make a technical point, however, we note that the timetable lists Aitutaki as the stop—but it may still qualify. If you choose not to count 2,500 Cook Islanders (native Polynesians), Aitutaki's population consists of 12 Europeans.

Unusual complaint letter received by an airline: "Your service was excellent but your hostesses would look so much neater if they only would wear a slip under nylon blouses. Seeing a bra through a blouse reminds me of a Ford without a hood."

Odds and ends: If Air Transport Association directors approve, Air Traffic Conference in 1956 will spend $242,391.50 on ads to promote use of air mail and air parcel post, and $113,996.40 on ads urging servicemen to use scheduled airlines . . . British Overseas Airways Corporation says that "every third BOAC 'passenger' is an animal en route from one part of the world to another."

Sales, Traffic, Promotion

A "40-pound baggage attention light" has been tested by **Bonanza Air Lines** and will be adopted on a system-wide basis. A red bulb located on top of the baggage scale flashes on in full view of passenger and ticket agent whenever a weight on the scales exceeds 40 lbs. During 60-day trial, BAL says its excess baggage revenue collections doubled. "No arguments as to excess baggage have developed from passengers on the one hand, while ticket agents have been more inclined to collect excess with the glaring red light visible to the passenger and other people in the area," it adds. Interested airlines can get a print of the light from Roger Mohr, **BAL's** superintendent of communications, McCarran Field, Las Vegas, Nev. . . .

"Tigerflights to Europe" is title of pamphlet issued by **The Flying Tiger Line**, plugging charter flights at "attractive low . . . prices—generally less than $300 round-trip per passenger." Company offers 68-passenger DC-4s or 100-passenger DC-6s . . .

New, unusual contest is being sponsored by the **Air Cargo Association** of Washington, D. C., formed by airline cargo employes to improve interline relations and to give the shipping public a better product. Each month, an association committee selects the "most friendly, helpful and salesminded air cargo employe" at Washington National Airport. The prize: a night on the town for two, complete with chauffeur-driven limousine, dinner, dancing and a show. All cargo employes except supervisors are eligible. First winner was James Mellinger, Capital Airlines . . .

Capital Airlines has opened new Washington ticket office in lobby of Sheraton-Park Hotel . . . As a courtesy service to the public, **Ozark Air Lines** is selling at all ticket counters tickets to home games of Chicago Bears and Cardinals pro football teams . . .

New attractive **Pan American World Airways** booklet, "How To Lead A Double Life by Clipper," tells businessmen how to mix business with pleasure by use of alternate routings . . . **PAA** has won top international prize in 1955 Midwest Travel Writers' competition for doing the "most effective overall travel promotion job for an area in the world." Credit goes to John Creedy, PAA's pubrel director, and Rog Wolin, Latin American Division pubrel manager, who are responsible for the promotion program . . . PAA's LAD has also received a plaque from a panel of advertising experts for "distinguished use of matchbook advertising . . ."

Wash-'N-Dri is now being used by about 30 airlines. It's a paper "towelette" moistened with cleansing lotion and sealed in a metal foil packet. Cleans face and hands without soap, water or towel, dries quickly. Made by R. R. Williams Inc., 54 W. 21st St., New York.

Northwest Airlines in October and November used the *Chicago Tribune* for what the paper called the "most intensive travel advertising campaign ever placed in a single medium." Oct. 23 double-page spread on new New York-Chicago service was termed "the largest full color travel ad we ever published" in the paper . . .

Slick Airways has started scheduled helicopter passenger service, two round-trips daily, between Pomona and Las Angeles International Airport . . . Slick Airways has cut 1 hr. 7 min. off its nightly DC-6A westbound New York-Chicago-Los Angeles-San Francisco cargo schedule. "Improved, faster ground handling and operational procedures" are responsible, Slick said . . .

New York Airways now has joint fare arrangements with nine international airlines—Pan American, TWA, Northwest, Air France, BOAC, KLM, Sabena, SAS and Swissair. International transit passengers between Idlewild, on the one hand, and LaGuardia and Newark airports on the other, pay no extra charge for helicopter service. International originating or terminating passengers pay $3 LaGuardia-Idlewild and $5 Newark-Idlewild one way (tax not included) . . .

New Low NWA Fares Approved by CAB

Fares as low as 3.5¢ a mile for coach travel on freighter-type DC-4's between Twin Cities, Milwaukee, Detroit and New York have been put into effect by Northwest Airlines with CAB permission, but the Board said it will investigate the tariff.

Complaints received from other airlines did not state facts warranting suspension, but raised "issues which should be resolved by an investigation," CAB stated. United Air Lines and Capital Airlines filed protests. The latter said the fares were "unreasonably low" and "could only result in confused debasement of the coach fare structure of the country."

Coach-freight flights originate in late evening at Minneapolis and New York, Monday through Friday. Seats on the 62-passenger DC-4s may be reduced on any particular flight by removal or folding, to accommodate cargo. Fares are: between Detroit and Milwaukee, $9; between Detroit and Minneapolis, $20; between Detroit and New York, $18; between Milwaukee and Minneapolis, $12; between Milwaukee and New York, $29; between Minneapolis and New York, $36. NWA's regular coach fare, for example, is $24.70, Minneapolis-Detroit, and $47.70, Minneapolis- New York.

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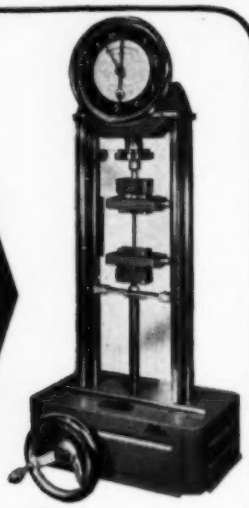

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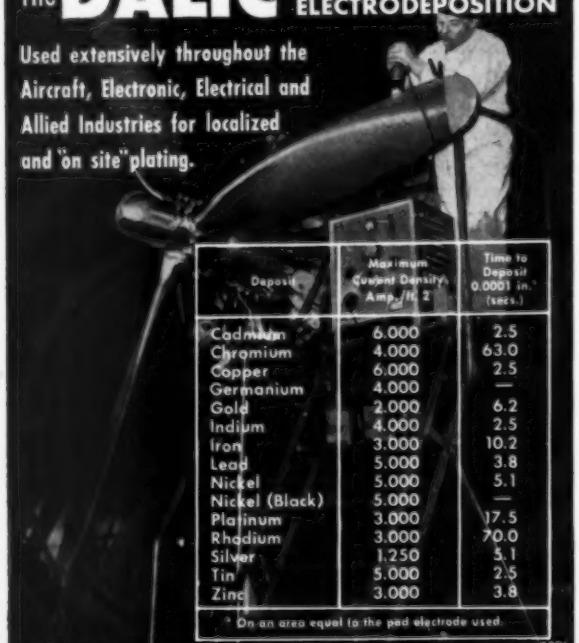

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Indium	4.000	2.5
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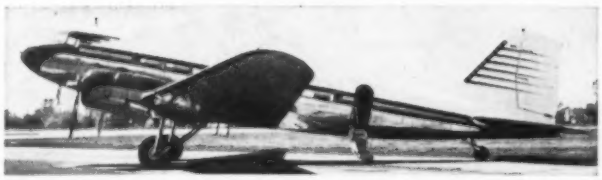

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CAB NEWS

Pending Cases

CAB decisions are expected this month in both the **Denver Service** and **Southwest-Northeast Service cases**, the combined effect of which will mean a new competitive era in U.S. airline operations. Five carriers stand to get new route awards in the Denver case and early reports indicate six lines will get new grants in the Southwest-Northeast case.

Both cases are far ahead of normal schedule but the November release is intended to permit all present five Board Members to take part in reconsideration actions so that they can be settled before Dec. 31.

Also expected this month are decisions in the **IMATA-ACTA Exchange Case** and, possibly, the **Large Irregular Air Carrier Investigation**. Highly controversial nature of the latter has resulted in a delay of approximately two months, as the original target date was in September.

A one-month extension has been granted for briefs to the Examiner in the **New York-Florida Case**. New deadline is December 15, indicating that with an Examiners' report, exceptions and further briefs, oral argument, etc., remaining, a final decision by March or April at the earliest can be expected.

Bureau of Labor Statistics Aviation Notes

• Sperry Rand Corp. and Electrical Workers-CIO negotiated additional 5c hourly step increases to all second class jobs, and 10c hourly to spray painters and upgrading of some learner classifications, to 1,750 employes of the Ford Instrument Div.; also general 5c hourly wage increase plus 3c for inequity fund; approximately 5.3c hourly company payment to pension plan to eliminate employe contribution-eligibility reduced to 25 years; improved sick leave; Blue Shield coverage all employes earning less than $6,000; 7.5% vacation pay bonus to employes working on night shift five to 10 months, and 10% bonus to those working 10 months or more; additional 2c hourly company payment to pension plan to reduce employes' 2.5% contribution, for 12,000 employes of the Sperry Gyroscope Co., Div.; also additional 5.3c hourly "package" apportioned between wages and amount necessary to eliminate employe contribution.

• Hayes Aircraft Corp. and UAW-CIO negotiated additional 5c hourly, effective 1956 for 3,250 production workers; also improved flight pay; time and one-half for Saturday work as such; seventh paid holiday; improvement in company-paid life, health and surgical insurance benefits and addition of laboratory and X-ray services; comparable benefits also extended to non-union office and technical employes.

• Collins Radio Co. and Electrical Workers-CIO negotiated 6 to 9c hourly wage increases (average 7.6c) for 800 Dallas employes; also improved holiday and vacation eligibility clauses; vacation pay based on gross earnings; mother-in-law and father-in-law added to emergency leave clause; company to pay one-half cost of lenses for safety goggles.

Summary of U.S. Local Service Airline Revenues and Expenses for Second Quarter of 1954 and 1955.

(Compiled by American Aviation Publications from Official CAB Data)

AIRLINES	TOTAL OPERATING REVENUES (IN 000'S)			PASSENGER REVENUES (IN THOUSANDS)			FREIGHT REVENUES (IN THOUSANDS)			TOTAL OPERATING EXPENSES (IN 000's)			AIRCRAFT OPERATING EXPENSES (IN 000'S)			GROUND & INDIRECT EXPENSES (IN 000's)			NET OPERATING INCOME (IN THOUSANDS)		
	1955	1954	% Change	1955	1954	% Change	1955	1954	% Change	1955	1954	% Change	1955	1954	% Change	1955	1954	% Change	1955	1954	% Change
Allegheny	1,447	1,124	28.7	982	702	39.9	. . .	. . .	. . .	1,410	1,174	20.1	622	528	17.8	788	646	22.0	37	-50	. . .
Bonanza	576	487	18.3	328	253	29.6	8	4	100.0	583	467	24.8	260	199	30.7	323	268	20.5	-7	19	. . .
Central	733	648	13.1	224	114	96.5	9	5	80.0	764	549	39.2	323	230	40.4	440	319	37.9	-31	99	. . .
Frontier	1,447	1,242	16.5	633	470	34.7	57	42	35.7	1,372	1,157	18.6	578	487	18.7	794	671	18.3	75	84	-10.7
Lake Central	624	573	8.9	271	177	53.1	. . .	. . .	. . .	630	578	9.0	279	261	6.9	350	317	10.4	-5	-5	. . .
Mohawk	1,014	944	7.4	823	691	19.1	14	13	7.7	908	897	1.2	418	444	-5.9	490	453	8.2	107	47	127.7
North Central	1,697	1,417	19.8	1,256	830	51.3	. . .	. . .	. . .	1,654	1,367	21.0	804	684	17.5	851	682	24.8	43	50	-14.0
Ozark	1,034	771	34.1	586	382	53.4	. . .	. . .	. . .	1,035	809	27.9	514	393	30.8	522	416	25.5	-1	-38	. . .
Piedmont	1,651	1,493	10.6	1,193	1,055	13.1	19	16	18.8	1,625	1,541	5.5	805	795	1.3	820	746	9.9	26	-48	. . .
Southern	906	837	8.2	449	337	33.2	. . .	. . .	. . .	848	812	4.4	363	367	-1.1	486	445	9.2	57	26	119.2
Southwest	1,087	835	30.2	735	498	47.6	15	9	66.7	999	743	34.5	497	356	39.6	502	387	29.7	89	92	-3.3
Trans-Texas	1,219	1,157	5.4	553	436	26.8	16	14	14.3	1,158	1,110	4.3	517	502	3.0	641	609	5.3	62	46	34.8
West Coast	862	829	4.0	497	458	8.5	10	5	100.0	921	862	6.8	415	405	2.5	506	458	10.5	-58	-33	. . .
TOTALS	14,980	12,479	20.0	8,530	6,403	33.2	148	108	37.0	13,907	12,066	15.3	6,395	5,651	13.2	7,513	6,417	17.1	394	289	36.3

EN ROUTE . . .

WAYNE W. PARRISH

The Lowdown on Wine-Drinking

So you keep your beer in your refrigerator for days on end? So you serve Rhine wine with your fish course? So you don't know the meaning of "Spatlese"? Okay, you barbarians, take out your upper plates, pull up your armchairs before the fireplace, stretch your feet out on the hassocks and get educated.

It all started at a very excellent dinner arranged by Hans von Studnitz and some of his Lufthansa (German Air Line) colleagues at the famous Jacob Restaurant (founded 1791) on the river Elbe near Hamburg. It was a warm August evening and all was fine with the world. With me were Messrs. Drinkwater, Shatto and Volk of Western Air Lines, refugees from the California wine industry.

Von Studnitz is quite an expert on German wines. He had picked out a fine selection for our plush dinner. Naturally the conversation turned to wines and beers and how to select them and how to treat them. I asked Hans if he would write it all out for EN ROUTE. He did so. From here on it is von Studnitz speaking:

The quality of a wine derives from (a) the composition of the soil, (b) the location of the vineyard and (c) the art of the wine grower in dealing with the plants and grapes in the proper manner.

German wines may be roughly grouped into Rhine (hock) and Moselle.

There are two kinds of Rhine wine: Rheingau, from vineyards between Konigswinter and Coblentz, and Palatinate, south of Coblentz.

The Rheingau produces the heavier and sweeter wines, the Palatinate the more aromatic ones. Top of the top of Rheingau wines are wines produced on the Johannisberg by Prince von Metternich and Count Matschuschka-Greiffenklau, and further down by the Royal Prussian Vineyard Schloss Rheinhartshausen in the possession of the Hohenzollern family.

Moselle Wines Lighter

Moselle wines comprise the region of the river Moselle, tributary to the Rhine and of the Rivers Saar and Ruwer, tributaries of the Moselle. These are lighter wines, sometimes very dry and very aromatic.

The Rhinelanders never drink Rhine wine, but prefer Moselle or beer!

The most sophisticated consumers of high class wines were found before the war east of Berlin in the now lost provinces of East and West Prussia, Pomerania and Silesia. Many Junkers died from drinking too much Moselle (3-4 bottles a night)!

It is the custom to serve Moselle with fish. To serve Rhine wine with fish is one of the greatest crimes possible against the culture of wine drinking.

We do not believe in having cocktails before drinking good wines during our meals. The alcoholic content of cocktails is strong and spoils the tongue for the enjoyment of wines.

Watch Those Labels!

If you buy a German wine be very careful not to acquire a wine which has been worked up with chemicals or mixed with wines of inferior quality.

Always examine the label for:

"Naturrein" (which means no additions).

"Schlossabfullung" (bottling for the chateau-owner of the vineyard).

"Spatlese" (harvested as late as November).

"Kabinettwein" or "Kabinettabfullung" (superquality reserved to be drunk by the owner with his friends).

"Beeremauslese" (most expensive of all wines. The grapes have been plucked as late as December at a very great risk of frost for the producer).

If you do not find one of the above distinctions on the label, you may be sure you are getting a cheap wine of secondary qualities.

Every "Jahrgang," or year, is different according to the weather. A very sunny summer does not guarantee a first-class wine. There must be plenty of sun in the months of ripening, like the end of August and September, but sun in May and June does not help very much.

Filled bottles must never stand up, but should be stored lying down.

Moselle may be put into the refrigerator two hours before consumption. Rhine wine one to one and a half hours before.

Never serve wines too cold, as you will then spoil the bouquet.

Flavor Must Be "Breathed"

Before you drink with your mouth, "drink" with your nose. Breathe the flavor of the wine. Keep the liquid for half a minute or a few seconds in your mouth before gulping it down.

Every good wine "works," as the cellarmaster would say. First class wines pass periods (like a girl having her days) when they must not be drunk. Leave them in peace and after half a year or so you'll find them even much better than before the working period started.

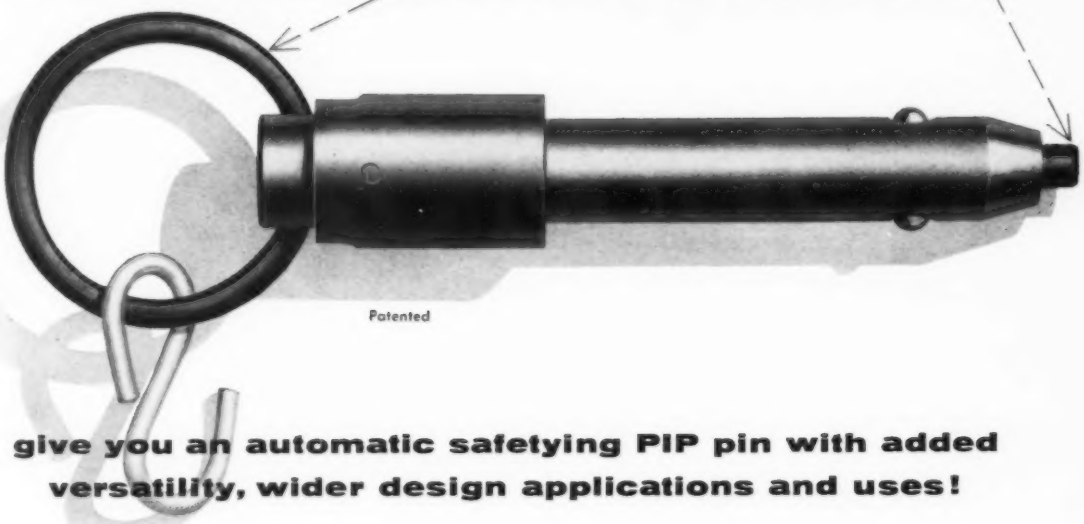
Sparkling wines (Sec and champagne) are usually made from cheap wines.

A final word: If you are a horseman you will be just as kind with your thoroughbred horses as with farmers' horses. You may be fond of wine, but that should not entitle you to ill-treat your beer. Never cool a beer longer than three to four hours in your refrigerator. Never keep it there for days and weeks. If you store it longer than two days in your refrigerator, you will kill the beer and it will taste worse than nothing.

In the August 29 issue of this page I gave a plug to Berlin-born Margot Rohde, stewardess on the German airline Lufthansa, as a beauteous gal who won't find it difficult to go places and do things. In response to requests for her photo, here are two of them. Unfortunately, the camera can't really do her justice. Nor can it reproduce that captivating accent.—W. W. P.

2*

MAJOR IMPROVEMENTS—



Patented

give you an automatic safetying PIP pin with added versatility, wider design applications and uses!

Like other PIP pins, the Model "B" double-acting pin is solving countless equipment and machine quick-disconnect problems. The continuous ring and extended spindle are changes enabling the "B" series PIP pin to work easily where stress loading or hole misalignment problems cause ordinary pins to bind and resist removal. The new continuous pull ring is designed for heavy duty use for forcible removal of "bound" pins. An intentional blow on the protruding head or tip shifts an inner spindle—locking balls recede into body of pin and pin moves with the blow for easy installation or removal.

Actually, the pin may be driven in or out! Both of these PIP design advantages, combined with higher material strength, are available in the "B" series pins which include "T", "L" and "Button" type head styles (optional) in sizes to most bolt standards.

Because PIP self-safetying is automatic, no bolt, nuts, cotter pins, etc. are needed. PIP pins are ideal for bracket, clevis, tube joining or similar uses in all commercial, industrial or critical military and aviation applications.

Complete drawings and specifications can be had by writing for brochure 5500.

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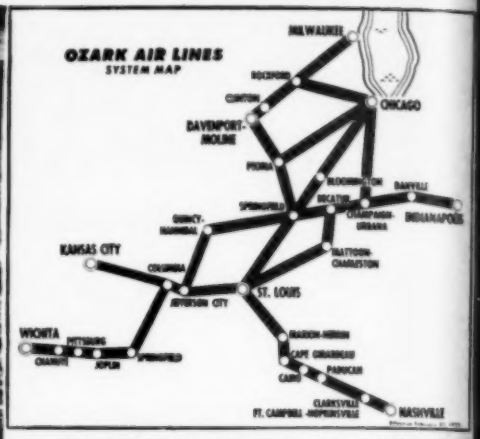

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